DOCUMENT RESUME

ED 092 404 SE 017 981

TITLE	Environmental Education at Post Secondary Level. Courses for Educators, Decision-Makers and Members of Professions Concerned With the Environment.
INSTITUTION	Organisation for Economic Cooperation and Development, Paris (France). Centre for Educational Research and Innovation.
PUB DATE	74
NOTE	183p.; See SE 017 980 for the first volume in this series
AVAILABLE FROM	OECD Publications Center, Suite 1207, 1750 Pennsylvania Avenue, N. W., Washington, D. C. 20006 ($6.50)
EDRS PRICE	MF-$0.75 HC Not Available from EDRS. PLUS POSTAGE
DESCRIPTORS	*Curriculum; Educational Research; *Environmental Education; Higher Education; Inservice Education; Instruction; *International Education; *Post Secondary Education; *Program Descriptions; Teacher Education

ABSTRACT

This second of two volumes on post secondary environmental education is comprised of three series of case studies that were carried out in various institutions of higher education in France, the United Kingdom, the United States, and Italy. These studies deal with the training or retraining of people in the following categories: (1) educators at primary, secondary and higher levels; (2) decision-makers; and (3) professionals whose work has a link with environmental questions (such as engineers, architects, and doctors). When appropriate, the information in the various case studies is organized under the headings: Who Does the Teaching?; Institutional Organization; Course Content; Teaching Methods, Media, and Materials; Research Base; Criteria of Success; and Recurrent Education. (DT)

ED 092404

DOCUMENT

centre for educational research and innovation

ENVIRONMENTAL EDUCATION AT POST SECONDARY LEVEL

COURSES FOR EDUCATORS, DECISION-MAKERS AND MEMBERS OF PROFESSIONS CONCERNED WITH THE ENVIRONMENT

U.S. DEPARTMENT OF HEALTH EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: SE SO
In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

2

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
O.E.C.D
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER.

SE017 981

OECD
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ED 092404

Centre for Educational Research and Innovation (CERI)

ENVIRONMENTAL EDUCATION AT POST SECONDARY LEVEL

COURSES FOR EDUCATORS, DECISION-MAKERS AND MEMBERS OF PROFESSIONS CONCERNED WITH THE ENVIRONMENT

2

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
1974

L'Organisation de Coopération et de Développement Économiques (OCDE), qui a été instituée par une Convention signée le 14 décembre 1960, à Paris, a pour objectif de promouvoir des politiques visant :

- *à réaliser la plus forte expansion possible de l'économie et de l'emploi et une progression du niveau de vie dans les pays Membres, tout en maintenant la stabilité financière, et contribuer ainsi au développement de l'économie mondiale ;*
- *à contribuer à une saine expansion économique dans les pays Membres, ainsi que non membres, en voie de développement économique ;*
- *à contribuer à l'expansion du commerce mondial sur une base multilatérale et non discriminatoire, conformément aux obligations internationales.*

Les Membres de l'OCDE sont : la République Fédérale d'Allemagne, l'Australie, l'Autriche, la Belgique, le Canada, le Danemark, l'Espagne, les États-Unis, la Finlande, la France, la Grèce, l'Irlande, l'Islande, l'Italie, le Japon, le Luxembourg, la Norvège, la Nouvelle-Zélande, les Pays-Bas, le Portugal, le Royaume-Uni, la Suède, la Suisse et la Turquie.

Le Centre pour la Recherche et l'Innovation dans l'Enseignement a été créé par le Conseil de l'Organisation de Coopération et de Développement Economiques en juin 1968 pour une période initiale de trois ans grâce à des dons de la Fondation Ford et du groupe Royal Dutch Shell. En mai 1971, le Conseil a décidé que le Centre poursuivrait ses activités pour une période de cinq ans à compter du 1er janvier 1972.

Les principaux objectifs du Centre sont les suivants :

- ***encourager et soutenir le développement des activités de recherche se rapportant à l'éducation et entreprendre, le cas échéant, des activités de cette nature;***
- ***encourager et soutenir des expériences pilotes en vue d'introduire des innovations dans l'enseignement et d'en faire l'essai;***
- ***encourager le développement de la coopération entre les pays Membres dans le domaine de la recherche et de l'innovation dans l'enseignement.***

Le Centre exerce son activité au sein de l'Organisation de Coopération et de Développement Economiques conformément aux décisions du Conseil de l'Organisation, sous l'autorité du Secrétaire Général et le contrôle direct d'un Comité Directeur composé d'experts nationaux dans le domaine de compétence du Centre, chaque pays participant étant représenté par un expert.

* * *

© Organisation de Coopération et de Développement Économiques, 1974.

Les demandes de reproduction ou de traduction doivent être adressées à :

M. le Directeur de l'Information, OCDE
2, rue André-Pascal, 75775 PARIS CEDEX 16, France.

PREFACE

Document No.2 comprises three series of case studies which were carried out in various OECD Member country institutions and deal with the training or retraining of the following categories:

- educators at primary, secondary and higher levels,
- decision-makers,
- professionals whose work has a link with environmental questions, such as: engineers, architects, doctors ...

Document No. 1, published simultaneously, is a series of 12 case studies on post-secondary educational institutions training future environmental specialists and generalists.

This investigation is part of CERI's work on environmental education at university level which was launched with an International Workshop held in Tours (France) in April 1971. The conclusions reached at this meeting and its main working documents have been published under the title "Environmental Education at University Level: Trends and Data", pp. 320, OECD, 1973.

The Tours Workshop centred mainly on: defining the objectives of environmental education at university level, i.e. training of specialists, training of generalists or co-ordinators, education of citizens and training of researchers on the one hand; defining basic principles guiding curriculum organisation (e.g. identification of unifying themes permitting interdisciplinarity(1), i.e. the integration of the various disciplines involved in environmental matters) on the other.

Following on the recommendations put forward at the Workshop(2) it seemed desirable to review not only past experience in the training of future environmental specialists and generalists, but also the courses offered to educators, decision-makers and professionals dealing with environmental questions.

---

1) The "Interdisciplinarity" was the leading concept for the work on environmental education. It was the subject of an international seminar held in Nice (France) in September 1970. Preparatory work and conclusion of this meeting have been published by OECD: "Interdisciplinarity: Problems of Teaching and Research in Universities", pp. 334, OECD, 1972.

2) See Recommendations for International Co-operation, op. cit. p.35.

The following case studies concern both those students aiming at a career in one of the three categories above and persons already engaged in professional activity in these categories.

In order to provide some common framework for these various case studies, a series of questions was suggested to the authors of these studies under the following headings:

- Who does the teaching?
  Kind of expertise possessed by the educators, criteria for faculty selection, status, background (professional specialists or educators)...
- Institutional organisation
  What is the organisational base of the teaching: Department, School, Faculty, Centre ...? Relationship between the institution and the university, relationship with the community ...
- Course content
  Theoretical bases of courses (interdisciplinary approach), scope of studies ...
- Teaching methods, media and materials
  Teaching methods, use of new educational technologies, non-classroom learning, evaluation ...
- Research base
  Role and use of student research, basic or applied research (Environmental Consultancy), links between teaching and research ...
- Criteria of success
  Number of enrolments, proportion graduating, increase in numbers enrolling, employment opportunities, professional assessment of the quality of the degree ...
- Recurrent education
  Recycling, continuous training.

As some of the headings and corresponding questions have also been used as a framework for the study on the training of specialists and generalists they do not always apply to the three categories considered in this document.

The case studies described in the following pages will be used as reference documents for the international meeting to be held at RUNGSTED in Denmark from 4th to 7th June, 1974. The main objective of this "Conference on Environmental Education at Post-Secondary Level: Review of Experience - Future Action" is to survey past experience and draw from it relevant conclusions for necessary future action.

The Centre for Educational Research and Innovation of OECD is greatly obliged to the authors of the case studies and especially to the National Association for Environmental Education (United States and Canada) for its key role in the collection and establishment of North American studies.

The opinions expressed in these studies are those of the authors, and as such do not necessarily reflect the position of the OECD or those of the national authorities concerned.

J. R. GASS
Director
Centre for Educational
Research and Innovation

CONTENTS

Part One

EDUCATORS

FRANCE

University of Rennes

INSTITUTE OF BEHAVIOURAL AND ENVIRONMENTAL SCIENCES
by G. RICHARD 11

UNITED KINGDOM

University of Liverpool

INSERVICE PROVISION IN ENVIRONMENTAL EDUCATION
by W. E. MARSDEN 19

University of Reading

DIPLOMA IN ENVIRONMENTAL STUDIES IN EDUCATION
by T. DAVEY 33

Northumberland College of Education

DEPARTMENT OF ENVIRONMENTAL SCIENCE
by L. O'DONNELL 51

UNITED STATES

The University of Michigan

SCHOOL OF NATURAL RESOURCES
by P. H. SANDMANN 61

Part Two

DECISION MAKERS

ITALY

INFORMATION SEMINARS FOR SENATORS OF THE REPUBLIC
by V. GIACOMINI 73

ITALY (cont)

The Pro Deo International Free University of Social Studies

TRAINING COURSE ON ENVIRONMENTAL POLICY
by V. GIACOMINI 79

UNITED STATES

Environmental Protection Agency

DECISION MAKERS ENVIRONMENTAL SEMINARS
by J. BAHNICK 87

Indiana University

ENVIRONMENTAL STUDIES PROGRAMMES
by C. E. NELSON 97

The Florida State University

THE FLORIDA RESOURCES ANALYSIS CENTER PROGRAMME
by E. A. FERNALD 111

Part Three

MEMBERS OF PROFESSIONS CONCERNED WITH THE ENVIRONMENT

FRANCE

National School of Public Health

ENVIRONMENTAL EDUCATION FOR THE HEALTH PROFESSIONS
by J. S. CAYLA 121

UNITED STATES

Michigan State University, College of Engineering

ECOSYSTEM DYNAMICS: A CASE STUDY OF AN EDUCATIONAL PROGRAMME
by H. KOENIG and E. D. GOODMAN 127

University of California at Berkeley

COLLEGE OF ENVIRONMENTAL DESIGN
by L. C. WHEATON 135

Columbia University

SCHOOL OF PUBLIC HEALTH
by H. SEWEL 157

Michigan State University

DEPARTMENT OF FAMILY MEDICINE
by S. M. JOHNSON 169

Part One

EDUCATORS

University of Rennes

INSTITUTE OF BEHAVIOURAL AND ENVIRONMENTAL SCIENCES*

Rennes, FRANCE

by

G. RICHARD, Director

* Institut des Sciences du Comportement et de l'Environnement.

The Institute is concerned with environmental education at post-secondary level and provides three types of training.

- Training of Specialists and Generalists

This course caters for students who have graduated (or hold equivalent qualifications). It provides either a general training (basic post-graduate course for a master's degree in behavioural science and environmental science) or a specialised training (master's degree in the science and technology of eco-ethology as applied to land-use). It was officially initiated in October 1972.

- Training of Professionals

This course is part of the University's recurrent training scheme. It caters for specialists in environmental or land-use studies and involves a multi-disciplinary approach to regional problems.

- Training of Educators

This is the subject of the present report.

TRAINING OF EDUCATORS

Motivation

Up to 1968 one of the traditional tasks of a university was the training of secondary school teachers - in the biological disciplines this was practically its whole task.

It is no secret that those who compile secondary school syllabuses are devoting more and more attention to sophisticated research and fashionable disciplines (as witness the craze for "molecular" biology 7 or 8 years ago or, more recently, for ecology). At the same time, there has been no change in the time-lag between scientific discoveries and their inclusion in the syllabus, and we find in consequence that, although environmental studies have been a feature of secondary school programmes for the last ten years, the text books used by our colleagues still teach "preferendums" on the lines they were presented by researchers 20 years ago. Now that the Nobel prizes awarded to Lorenz, Tinbergen and Von Frisch have put the seal on animal behaviour there is hope that it will be put on the syllabus at long last. Nevertheless, if this means replacing the work Fabre was doing around 1900 by the conclusions Lorenz produced in 1950 we shall merely fall out of the frying pan into the fire. Ethological science has made progress since both these dates.

Faced with this situation, universities are forced to fight on two fronts. They must:

- provide an emergency scheme for a thorough retraining of their own staff and practising secondary teachers in ecological and ethological science;
- make it a matter of similar urgency to introduce these same disciplines into their initial training courses for future teachers.

Nonetheless, it is one of the calamities of biology teaching at university level that very few French universities have the trained academic staff required to fulfil this task. Even fewer universities possess the indispensable tools for the job (in particular, organised facilities for practical

environment study). The University of Rennes and its Biological Station at Paimpont, however, provide an exception and can offer all that is required. Not only are their teachers well versed in the problems of nature and the new teaching methods these problems necessitate, but they also have facilities for accommodation and study that have been specially designed for such courses.

For this reason a number of experiments have been attempted, even if they have encountered certain difficulties. One example is the recent long and bitter fight put up by our Institute to ensure that the 100 hours of biology required for the first-year DEUG certificate should not be devoted entirely to cellular biology but equitably divided into 50 hours' cellular biology and 50 hours' biology of organisms, both disciplines being taught in the form of practical courses at Paimpont (8 days before the start of the university year the battle had still not been completely won).

But the training of secondary school teachers is not sufficient to meet the country's real needs in this field. Efforts must also be directed towards training primary school teachers - indeed, there is talk nowadays of teaching ecology right from the infants school, and it is conceivable that the current practice of sending whole classes for a spell to the country, the seaside or a mountain resort might one day be specifically linked up with environmental studies.

One of the aims of our teaching staff is to train all-round educators for service wherever there is a need to inform the public and enhance its awareness of problems relating to the environment (natural parks, protected areas, districts scheduled for urbanisation, etc.). This is our "Nature Guides" scheme. At the same time we are tackling the problems as they arise in the course of our developing the fundamental necessities of:

- Training of secondary school teachers; and
- Training of Nature Guides.

1. WHO DOES THE TEACHING?

The teaching is done by mixed teams of academics and professionals with considerable experience of the fields concerned, i.e. biologists, ecologists, jurists, agriculturalists, land-use planners (water-courses and forests), administrators of natural parks in various regions, and so on.

The idea of a team for such training is basic because an environmental course cannot be put on by a single person. However, each member of a team may well confine himself to a specific subject and the confrontation of these various subjects at joint training sessions make for dynamic teaching and

lively interdisciplinary contacts which facilitate discussion and the exchange of ideas.

The professional staff are perhaps more concerned than the academics with practical schemes but they also help to compile the general syllabus of studies.

All the university staff have long been familiar with the problems of field work. All those at present serving in the teams at the Paimpont station and the Rennes laboratories concerned have had field training since they were students. The practical summer courses they have attended since 1958 have provided the arguments and results needed to convince the administrative authorities of the justification for building a biological station to accommodate a large number of students.

One of the originalities of the Rennes Institute is just this complementarity of its teaching staff. Some have a thorough ecological training and practical experience, some have reached an equivalent standard in ethology, and some are now engaged in current schemes for environmental development and protection. The doctorate theses written by the team members have so far all reflected this initial specialisation. However, in the last two or three years a growing eco-ethological synthesis has been gaining ground, and this will be the point of departure, not only for the future investigations of the research workers but for their teaching as well.

Because of their familiarity with field work and their habit of operating as a team, all these teachers have a particularly friendly and forthcoming approach, as all who have attended the practical courses and seminars can confirm. So, to keep the environment courses going in the future, we feel that it is essential to continue to recruit colleagues who meet the following minimum requirements:

- They must have had field training as part of their own university studies or, if they are non-academics, they must have acquired good technical experience in one or more specific sectors.
- They must have a strong team spirit and be prepared to defend their ideas at joint training sessions.

2. INSTITUTIONAL ORGANISATION

The Institut des Sciences du Comportement et de l'Environnement is the basic teaching institution. It operates through the directors of the various laboratories and the Director of the Paimpont station who is assisted by a

Scientific Administrative Council and a Management Board. It receives its administrative and financial support from the University of Rennes which has given it the status of a UER (Study and Research Unit).

Teachers are remunerated either as established civil servants or on an hourly basis (from the university budget).

3. COURSE CONTENT

- Major theories of ecology; modern trends towards an eco-ethological approach.
- Man's place in the biosphere and examples of his effects on ecosystems.
- Evolution and the dynamic idea of biocoenosis; examples chosen from wild and cultivated areas.
- Invertebrate and vertebrate (primate) animal societies; individual intercommunication; human societies.
- Motivation and procedures in man's choice of living space.

This syllabus is taught through the medium of supervised observation during field work and is supported by a number of consolidation lectures at the university. Courses are divided into periods of practical work and seminars.

The following specific syllabus was tried out in the 1973 practical summer courses. It proved entirely satisfactory, enabling the participants to integrate their knowledge very effectively. It will be repeated in 1974.

I. Eco-ethological introduction to the study of a natural environment (common theme, 2 days)

II. General Ecology
Study of a characteristic association
- climatology
- abiotic factors
- animal and vegetable populations

III. General Ethology
Descriptive and experimental study of behavioural processes in land settlement
- Study of social insects, i.e. ants, wasps, bees

(10 days)

IV. Joint eco-ethological 'balancing' sessions.

(2 days)

V.	Ecology applied to the protection of natural environments	VI.	Ethological analysis of behavioural patterns

(8 days)

This experimental scheme was carried out with the active participation of a jurist specialising in rural law, the director of the Brienne Regional Park, the master of the Paimpont Wolf-Hunt, and other local specialists. Great importance was attached to the study of actual examples (the Parc de Brienne, the Parc d'Armorique and the Breton moors and coast).

The international character of such work as this is maintained through association with similar schemes in Great Britain, by personal contacts between members of the academic staffs and British, German, American, Canadian and other researchers.

It should be noted that this type of teaching has a feedback value for research (the programme of the Groupe d'Etudes des Landes Armoricaines sponsored by the DGRST for example) from which it will itself eventually derive benefit.

4. CRITERIA OF SUCCESS

In practical courses of this type, the number of trainees is limited by the fact that the teaching staff have to be permanently available. At the present time there are 20 trainees registered in each of the training groups for secondary school teachers, and ten are registered for the "Nature Guides" course.

There is no formal criterion of success in the practical graduate level courses apart from a collective report prepared by each group of trainees for which no marks are awarded. These reports are used as basic material for the publication of Cahiers de Paimpont, which it is hoped will appear more regularly in the future.

In the case of the "Nature Guides", a special diploma is issued by the University of Rennes after a written examination and a professional test (an individual report by each trainee on his field work).

University of Liverpool

IN-SERVICE PROVISION IN ENVIRONMENTAL EDUCATION

Liverpool, UNITED KINGDOM

by

W. E. MARSDEN, Lecturer in Education

INTRODUCTION

Discussions concerning the establishment of a university diploma course in environmental education at Liverpool began in 1970. The first meeting of the steering committee, attended by representatives from most of the colleges of education in the Liverpool Institute area, took place in September of that year, with a view to starting the course in September 1971.

An important preliminary question was to decide whether the course should be established on a one-year, full-time, or a two-year, part-time basis. A full-time course would draw on a national catchment, and be based largely on daytime work during the week, but would require secondment of staff from their teaching duties. A part-time course would be restricted to a local or regional catchment, and involve work in the evenings, at weekends, and during holiday periods, but would not require secondment of teachers. The general concensus of opinion at the time was that secondment would be difficult to obtain, and the second course of action was chosen.

The diploma was quite specifically geared to providing an in-service course in environmental education for 'educators'. To quote from the details sent out to intending applicants, the course was designed "for those who wish to undertake increased responsibility in the field of environmental education, with particular reference to the 'middle years of schooling'" (i.e. 8-13 years of age); the dual purpose of the course being "to introduce its members (or reinforce for them) the structures, concepts and skills of the component disciplines involved in environmental education, and at the same time to provide a strong professional bias, both theoretical and practical."

In other words, the course was intended not only to cover a selected content drawn from the wide field of environmental education, but also to provide an introduction to pedagogic practice as appropriate to this area of study.

1. WHO DOES THE TEACHING?

In the light of these basic objectives, it was envisaged from the start

that the teaching of the diploma would be in the hands of staff from the colleges of education associated with the University of Liverpool Institute of Education. In this way, expertise would be made available both in respect of subject matter and teacher education. It was considered desirable to harness as wide a range of this expertise as possible, bearing in mind that the course should not become too fragmented.

The staff contributing to the diploma were given considerable freedom in developing curricular units, within the guidelines of the objectives of the course and the constraints of a centrally-produced timetable. None of the teaching was provided by the University, whose role was restricted to co-ordination, general administration, and validation of the course. The commitment of college staff to the course was in addition to their normal teaching load, and thus fees were paid to them for this work, more or less according to the time expended.

The net result of the early discussions was to establish, in broad terms, a co-operative teaching venture, with a division of labour in a framework of blocks of time allotted to each college. Within these blocks of time, separate colleges tended to structure their contributions as team efforts, either inside an individual department, or on an inter-departmental basis, depending on the nature and distribution of the expertise present within the college.

In general, the college staff involved in the course have been graduate subject specialists at Bachelors', Masters' and even Ph.D. degree levels and, equally important, have had considerable experience both of teaching in schools (though at secondary rather than primary level), and of teacher education.

It was fortunately possible to make use of most of the staff who volunteered, with the prior agreement of their respective principals, to make a contribution to the course. While some overlap of offerings was apparent, it was kept to a minimum without too much difficulty. A high level of desire to contribute to the diploma was manifested by the majority of college principals and their appropriate subject department heads.

2. INSTITUTIONAL ORGANISATION

These teaching arrangements seemed appropriate to the needs of an environmental education course, in an area of study encompassing a wide range of content and method, and requiring the presentation of a variety of approaches and points of view. The use of so many separate colleges posed a management and to a certain extent a human relations problem, made easier by the fact that the teaching effort was in addition to normal college timetabling

commitments and separate from them; and by the previous experience of the co-ordinating tutor for the course, who had been a member of staff of one of the colleges concerned, and had a reasonably wide acquaintance with members of staff of colleges in the Liverpool area. From the start, there was a helpful degree of 'give and take' between the colleges, and no major personal relations problems have interfered with this co-operation since.

Seven colleges of education: F.L. Calder, Christ's, Edge Hill, Ethel Wormald, I.M. Marsh, Notre Dame, and S. Katharine's have been involved in the first three years' running of the course. All of these except Edge Hill (Ormskirk) are located within Liverpool itself, and have proved relatively accessible for members of the course. Two of these colleges, F.L. Calder and I.M. Marsh, are specialist colleges, in the fields of home economics and physical education respectively. In addition, Chester College has made a small but valued contribution to the diploma.

Despite the fact that the teaching commitment was confined to evenings, weekends and holiday periods, the use of so many institutions clearly imposed the need for a carefully structured timetable. The problem was overcome, as already noted, by giving each college a block of time, differing in length according to the nature of its contribution(s). Meetings have been arranged on two evenings a week, integrated where appropriate with field work at weekends.

A further organisational constraint has been financial. The course in principle has been self-supporting, expenses being met by fees paid by the students, in turn reimbursed by their local authorities. In practice, numbers recruited for the courses have not been quite enough to ensure financial viability, and some small help from Institute funds has been needed. Colleges have also contributed in that their 'capital equipment' has been used free of charge, and very few claims have in fact been made for expendable items used for practical and field work. Another financial problem has been the reluctance of local authorities to pay students' fees and expenses until the end of each year of the course, which has created embarrassment for some students. It will be appreciated that the emphasis on field work, including three weeks' attendance during holiday periods, has made this course a more expensive one than most diploma courses.

A further organisational responsibility has been the need to cater, in co-operation with college tutors, for the needs of a somewhat heterogeneous group of students. As could be anticipated, a wide range of interest has been represented in the various year groups, in terms of:

a) age, ranging from the middle twenties to middle fifties;

b) status, ranging from young assistant teachers through to experienced deputy heads, and even head teachers of junior schools;

c) type of experience, including members of junior, middle and secondary school staffs, with varying degrees of responsibility inside their schools;

d) initial training, ranging from teachers with certificates of education, to graduates (who as a condition of entry have also to possess an initial teaching certificate), including bachelors of education;

e) subject expertise, including historians, geographers, scientists, physical educationists, and specialists in art, craft and domestic science, as well as general subject junior and middle school teachers;

f) domestic status, including single men and women, and married people with considerable family responsibilities, an important informal factor to be taken into account in the context of the sort of demands made by the course.

It would have been quite impracticable to create a tailor-made course to cater for the individual needs of such disparate groups. From the beginning, therefore, the course was directed towards the 'middle years of schooling', and has made no pretence to provide directly, for example, for the needs of infant teachers, or those involved with specialist work in the upper reaches of the secondary school.

A series of options has been offered to enable some differentiation, and students have been encouraged to choose options in areas of study which represented important gaps in their previous training, yet which at the same time have interest for them as teachers.

While this heterogeneity has posed problems, it has had its positive advantages, creating the opportunity for some cross-fertilisation of ideas between junior and secondary school teachers, between secondary subject teachers with different specialisms, and so on; and a highlighting of the varying problems which teachers in different sorts of schools have to face. There has been less of the 'inbreeding' syndrome that is sometimes present in courses with a homogeneous membership.

It has not been possible to arrange as wide-ranging a counselling and advice service as would have been desirable, but help has been provided, of three main types.

a) The university co-ordinator has held meetings at the start of each term to cope with problems of general group nature. Individual students have been invited to write to him with reference to any personal problems, concerned, for example, with regular attendance at field weekends, a course requirement which might be difficult to meet in the context of a domestic upheaval or a change of job; or to seek advice on further in-service training, such as the prospect of later undertaking a Master's degree course.

b) More specific day-to-day help has been voluntarily provided on the spot by college tutors, and much time has been allotted over the course for discussion in class of various problems involved with the course content and work requirements. The members of the year groups have generally been loquacious, and not afraid to vent their feelings.

c) In addition, a specialised personal tutor has been allotted to each student for advice on and supervision of a 10,000 word dissertation, a task involving personal field work and forming a major part of the course assessment. For fulfilling this particular role, often an onerous one, college tutors have been paid.

In part for financial reasons, but rather to mesh in with the likely future expansion of specialist diploma courses in colleges, it has been decided that from 1974 the whole organisation of the course should be passed over to the colleges. Work on the course will become part of the agreed teaching commitment of the staff concerned, and hence will not involve external remuneration. The validation of the diploma will continue to be made by the University of Liverpool, but this will be the limit of the Institute commitment to the course. The likely future grouping of colleges in the area should provide the opportunity for organising a more compact teaching structure. The administration of the course is to be taken over by one of the contributing colleges, who will work in co-operation with two or three other colleges to cover the teaching commitment.

3. COURSE CONTENT

In the contexts of its position in secondary schools and colleges of education, and by implication also in in-service courses, environmental education in Britain stands at something of a cross-roads, a point of convergence of two quite separate and even alien traditions.

Briefly, the first of these is a tradition stemming from eighteenth- and nineteenth-century progressive educationists, based on a concept of education which placed the child at the centre, to be initiated relatively painlessly into work of a school type through contact with familiar objects or scenes, prior to moving out from these to the unfamiliar and exotic. Hence environmental studies at primary school level derives very largely from a local studies approach, and might well in practice in many cases be termed 'Local Studies'.

Here the local environment is the arbiter of content, the teacher an opportunist who accepts and adapts what it has to offer. Far from this providing a 'holistic' approach, as its proponents often suggest, at the opposite and more desirable pole from 'subject fragmentation', it tends to offer the riotous compartmentalisation that is present in the environment itself. Each leaf, log, vegetation quadrant, architrave, gravestone or traffic intersection is worthy of study for its own sake. This is not written as a criticism. It is manifestly in harmony with the need to latch on to the junior school child's wavering interests, and the perceptive teacher will strive to lead out from these local particulars to more general principles. But the approach is essentially pre-disciplinary, appropriate to the junior school child, yet surely not adequate for his teacher.

The second tradition derives rather from interdisciplinary ventures at university level, where in social and environmental science faculties it is increasingly accepted that solutions to applied problems in social and environmental studies must be sought through the utilisation of methodologies and concepts derived from a variety of subject disciplines. Urban problems in particular are seen as inviting the convergence of a number of separate but relevant disciplines. The aggregation and hopefully the synthesis of concepts, principles and methods of study needs ideally a team approach, and is a highly taxing process. Interdisciplinary work is academically very rigorous and quite different from the pre-disciplinary approaches advocated in the progressive primary school tradition.

In an interdisciplinary approach, the integrating factor is an orientation towards a problem, a theme, or a topic. On to this integrating problem, theme or topic the techniques and concepts of separate disciplines are focused, and any synthesis is of necessity a high order intellectual activity. Such approaches are therefore outside the scope of junior school work, and it is a moot point whether they can with success be introduced at the secondary school stage.

It would be dangerous to assert, however, that pre-disciplinary or even uni-disciplinary courses in themselves provide sufficient contribution to the developing expertise of the student teacher in college, or the trained

teacher in an in-service context. For this reason, it would seem essential to provide in a diploma in environmental education an interdisciplinary structure, making optional use of the wide range of subject expertise available among the college staffs.

Hence the 'integrating function' for the Liverpool diploma has been provided by such themes (and problem issues) as 'the downtown environment' on the one hand, highlighted through social, historical and geographical concepts such as sequent occupance, milieu, urban zonation, and the like; while in the rural context various ecological principles have been explored, in particular areal settings as part of the environmental science section of the course. Such concepts have been 'revisited' through the provision of field courses in external areas, furnishing contrasting illustrations in starkly or subtly different environmental locations.

One of the major attractions of an environmental studies course lies in the opportunity it supplies of linking together natural and social science elements. It is something of a problem, however, in a course where one college might provide the bulk of the environmental science offering, and another a particular social science contribution, to ensure that this takes place in practice. Such linkages have been attempted particularly on the field excursions, though whether what in fact occurs is a true synthesis or merely a juxtaposition must depend in the final analysis on the skill of the instructor and the quality of the student.

It was envisaged from the start that the course content should represent a balanced approach between social and 'non-human' environmental elements, and between urban and rural environments. In the event, the city location of the course and the interests of college tutors have led to something of a bias in favour of social and urban aspects. This seems in contrast to the many environmental studies courses which have an overwhelmingly rural bias. Many such courses might more truly be labelled 'Environmental Science', with their strong emphasis on physical process rather than locale, and an introduction of man, society and the urban area only in so far as they inflict their garbage on the environment.

It was felt strongly at Liverpool that a professional course in environmental education should emphasise home, school and society, preferably in some sort of ecological framework, in addition, for example, to energy exchange in the atmosphere, and the adaptation of plants and animals to their environment, and see man from something more than a horticultural viewpoint. Attention was to be paid to the behavioural environment as well as the environment of phenomena; the intention was to view the environment as part of man's cultural heritage. At the same time there was no intention of neglecting

the need to develop an awareness of and concern for applied issues such as pollution and conservation, population control and resource planning, but without unbalanced, quasi-religious, doom-watch overtones.

In addition to the environmental content, a substantial pedagogic offering was seen as a central feature of the course. Although the course was to have a more practical orientation than many diploma courses, there should still be a firm theoretical underpinning. Hence one college provided courses in curriculum development and innovation, and applied case studies linked with the Liverpool Educational Priority Area (E.P.A.) project. In addition, a requirement for the dissertation was that it should contain an attempt to relate content to pedagogic practice.

The course content was divided into compulsory and optional elements. A full term was allotted to environmental science matters, with a strong rural emphasis. Historical and geographical aspects of urban and rural areas tended to be considered together, in part because of the happy chance of the presence of members of staff in at least two departments with considerable expertise in both these subject areas. The specialist colleges provided shorter introductory courses in their particular fields of outdoor pursuits and 'the home and the environment'. As has already been indicated, in these compulsory elements of the course there was a significant bias towards social rather than environmental science aspects.

This was redressed, however, by the choice the students made of optional elements in the course. Eight options were offered, out of which the four most popular would be selected. Three out of the eight, related to weather study, geology and woodland ecology, were in the realm of the environmental sciences, and all three of these were chosen. Hence three-quarters of the students spent two full terms on environmental sciences. In addition, two out of the three field weeks had a stronger environmental than social science emphasis. In the final reckoning, therefore, the principle of balance in this context was preserved, remembering that the third major segment of the course was professional.

No such balance was achieved between local and external areas, though the availability of three field weeks of a residential nature made possible the presentation of three contrasting environments, in the Lune valley, the Durham area, and southern Scotland, at the national level. In international terms, an option course was offered, but was not taken up by the students. Hence the approach used was systematic rather than concentric. General principles were derived very largely from variegated local areas. Perhaps the concentric approach, presenting similar issues at local, national and international levels, has too strong geographical overtones for some. The teachers

on the course clearly perceived its function in large part as offering the expertise to allow them to undertake local studies work in their schools.

To summarise, the intention has been to anchor the Liverpool Diploma in Environmental Education fairly centrally between the biospheric and societal poles of the environmental dimension. It can be argued that the field of study is so wide that it is more sensible to concentrate on one or the other. We felt, however, the desirability of investigating interaction between the two poles to be a more important criterion in the context of teacher education. In other words, the intention was to use the environment for a variety of educational purposes, as well as providing an introductory scientific and/or social training in how to use the environment properly. There need be no incompatibility between these two slants on environmental education, and indeed it is desirable that they should be kept in balance. It may be suggested that some social studies courses are too man-centred and perhaps over-indulgent; while some environmental science courses view him almost exclusively as a biotic agent and destroyer. Environmental Education courses should not become solely Environmental Problems courses, though the major social and environmental issues of our time can justifiably loom large. They should have an intrinsic educational function rather than an extrinsic socialising (even indoctrinating) one. They should not become merely a means of making the natural sciences 'relevant', or a branch of moral education.

4. TEACHING METHODS, MEDIA AND MATERIALS

The range of content involved in environmental education is often of a type which can easily be translated into visual form. Hence at the beginning of the course, the students were introduced to varying interpretations of the scope of environmental studies by two films providing case studies of actual teaching experiences in this area of study. One was taken from a junior school in Shropshire, set largely in a rural environment, and the other (a B.B.C. film) from a secondary school in Cornwall, set in a small and formerly industrialised town.

In addition, teachers were often introduced to a locality they were later to study in the field through the use of visual aids. Such aids were also used to illustrate contrasting landscapes from those which could be studied directly in the field. While the human science elements of the course were thus linked with visual media, in the environmental sciences field work was integrated with laboratory work, specimens being brought back from the field for more detailed study. Classical pedagogic scientific techniques of observation, collection, recording, classification, data storage, and inter-

pretation, were followed. Social aspects of the course were enhanced by case studies drawn from the Liverpool E.P.A. project and its notion of the community school, while a series of visits to various types of schools was arranged in the final term, after the written examination.

'Integration' of content drawn from more than one discipline took place at two levels. The first of these was the personal level, where a number of the staff partaking in the course might have high level qualifications in two areas of study, particularly geography and local history, but also biology and archaeology, and biology and resource management. In addition, there were staff with applied skills in disciplines of education, as well as in their original subject specialisms. Then within at least one college there was inter-departmental co-operation, taking the form of a team effort in which a particular locale provided the integrating theme, used by various tutors to exemplify major concepts from their particular disciplines. There was no direct inter-college team teaching, though the central organisation of the course ensured that similar contributions were grouped together.

The organisation of the course was thus on a systematic rather than an areal basis. Most of the compulsory course in environmental science, for example, was undertaken by one college. In the social science (including geographical and historical) aspects of the course there was a wider range of contributions, and lines of demarcation were laid down which were largely if not entirely followed. Overlap problems would be less likely to occur, of course, where a single college was responsible for the whole of the teaching. On the other hand, in this case there would be less likelihood of as wide a range of expertise being available as has been the case with a large number of colleges. It must be admitted, however, that the Liverpool arrangement has necessarily led to fragmentation rather than coherence in teaching method. At the same time, an acquaintance with contrasting methods of study in similar content areas could well be seen as an advantage.

As has already been indicated, a series of contrasting field work opportunities has constituted a central feature of the course, as they must of any viable environmental education experience. The field work provision has fitted in well with the current Department of Education and Science regulation of ten weeks full-time activity or its equivalent for two-year part-time diploma courses, the weekend and holiday week field work being aggregated to make up ten weeks.

Evaluation of this field work, and the practical and laboratory work associated with it, has been made through the submission of a course work file, constituting one-third of the assessment. This file has included pieces of work associated with all the major elements of the course. The practical

work has also been orientated towards the development of skills and techniques necessary for the presentation of the 10,000 word dissertation, making up the second major element in the evaluation procedure.

5. CRITERIA OF SUCCESS

In terms of recruitment, providing evidence of whether a course meets a felt need, the diploma has only proved partially successful. It was felt that each group should approach twenty strong, and that there would be no difficulty in reaching this number. In the event, the first course (1971-3) attracted 13 members; the second (1972-4) initially 18; while 15 students have been enrolled for the 1973-5 course.

Of the first group, one left for another post in a distant part of Britain at the end of the first year, two have failed to complete the course through heavy school commitments, and of the remaining ten, eight have graduated, and the other two are likely to do so, though they have still the dissertation to complete. There have unfortunately been many withdrawals from the 1972-4 group during its first year, reducing its numbers by almost half. Three sets of reasons can be advanced in explanation: a change of job or place of residence; health; and family commitments. The heavy weekend field work commitment has been found too demanding by some.

On balance, we have been disappointed in the total numbers applying for the course, which have hardly made it cost-effective in any strict sense. On reflection, it might have been better to offer the course as a full-time one, though this is being wise after the event. A full-time course would necessitate the availability of staff committed to it as part of their normal daytime teaching load. The numbers have on the other hand been very satisfactory for teaching purposes.

As competition for places has not been intense, the quality of work presented has generally been of a more satisfactory nature than might have been anticipated. The external examiner has been impressed by the amount and scope of the work which has been undertaken, and has had very few reservations about allowing all those who have completed the examination requirements to pass. On the other hand, there has been no high-level all-round work from this first group which would have justified a distinction grading. In fact the college staff have been more critical of the quality of work presented than was the external examiner, and in most cases tended to mark rather severely.

In general the students have expressed satisfaction with the course, though criticism has been made of certain elements, such as the overall

quality of two conferences on the subject of environmental education which they were advised to attend. Complaints have been mostly on grounds of personal inconvenience caused to students by the heavy field work commitment, the occasional administrative lapse, or the late change of arrangements resulting from a college having conflicting commitments at the same time. There has been little overt criticism of the content of the course as such.

While a number of students have received promotions during the course, there is no evidence that it is the course itself which has helped them. Most in fact see the diploma as an aid to their normal teaching schedules, and have chosen to come on the course because of its strong practical orientation. Teachers seeking advancement in administrative and college of education fields tend rather to undertake more theoretical advanced diploma courses.

There has been no possibility of attracting external resources to help with the financing of the course. If anything, local authorities have shown themselves fretful about the additional expenses involved in this course as compared with other diploma courses. The ambivalent attitudes of central and local government to in-service work, when it is a matter not of public avowal but of financial crunch, is a source of frustration to the providers of in-service courses in general.

While it would not be true to say that the students' experience has been linked with community work to any considerable degree, a serious attempt has been made to develop an awareness of urban community education issues in a more pointed way than many of the students had experienced before. One of the members of the 1971-3 group, who joined the course as a deputy headmaster, was later appointed head of one of the E.P.A. schools in the local area. The nature of the schools from which many of the teachers have been drawn has inevitably imbued the course with a sense of involvement in the problems of city schools. A number of secondary teachers have looked to the course to provide them with ideas for stimulating the interest of teenage pupils in their local environment. Hence the need for a pedagogic emphasis to the diploma has been reinforced in Liverpool by this priority area orientation.

The future organisation of the Liverpool diploma will hopefully be more compact, and the team-work between a smaller group of colleges, possibly even in a federated framework, following the James Report, will probably become stronger than has been possible in these preliminary years. The course will remain geared towards 'educators', and will retain its pedagogic orientation. There would seem a need to continue and extend such part-time courses for those many teachers unable to obtain secondment for full-time courses, a particular problem in big city areas, short of teachers and of financial

resources. It is interesting that the two environmental education diploma courses which have appeared since the Liverpool one began in 1971, at Reading and Sheffield respectively, are on a full-time basis. In principle, it would seem desirable to expand provision of both types of courses, and it is to be hoped that teachers and local authorities will increasingly appreciate the need to provide "recurrent education" in this particularly relevant field of study. So far, influential bodies in the field of environmental education have seemed to concentrate their efforts on the supply of ideas and materials for child education rather than for teacher education, which is surely the prior need.

University of Reading
School of Education

DIPLOMA IN ENVIRONMENTAL STUDIES IN EDUCATION

Reading, UNITED KINGDOM

by

T. DAVEY

Diploma in Environmental Studies in Education:

a one-year, full-time course for teachers of at least five years' experience. This course is now in its second year of operation.

1. WHO DOES THE TEACHING?

Professional or disciplinary expertise

The teaching of the diploma course is provided by a wide range of staff from the university, the nearby college of education (Berkshire College) and a number of other sources. Overall tutorial and administrative responsibility is held by a lecturer in education (B.Sc. Hons., Zoology, London University; Master's Degree in Zoology from Mount Holyoke College, Massachusetts, USA; a Post-Graduate Certificate in Education, London) who taught biology and other sciences in a variety of British schools for ten years before moving to the university three years ago.

The remaining staff may be grouped as follows:

a) Lecturers from departments of the university who contribute one or a series of lectures or teaching sessions specially designed for the diploma course. All these staff are highly qualified university personnel, usually possessing higher degrees with specialised research interests but who view these in a wide environmental context. Most have considerable experience in university undergraduate teaching.

b) Lecturers and professors from the university departments who are providing courses for other groups of students which are valuable to the students on this diploma course. These staff have similar backgrounds to those in the previous group but their first responsibility in their teaching is not to the students on this diploma course.

c) Lecturers in the School of Education with some specialist interest which is of relevance. All are graduates with considerable experience in school teaching at secondary level as well as experience in the initial training of teachers.

d) Lecturers from the local college of education, graduates concerned with main subject and curriculum work in the college, and all with school teaching expertise.

e) A variety of people from other sources who have particular expertise. These are frequently graduates and are drawn mainly from Her Majesty's Inspectorate of Schools, other universities, school teachers, the civil service and local authority employees and societies concerned with the environment.

The contributors to the teaching of the course include graduates in agriculture, botany, chemistry, economics, geography, history, horticulture, physiology, psychology, sociology, zoology and a variety of planning subjects.

Criteria for selecting faculty

None of those involved in the teaching of the diploma course are committed to it full-time. The course tutor was appointed to the school of education with responsibility for the training of future biology teachers who had already graduated and to make a general contribution to the work of initial teacher training. Only subsequently was she invited to establish the diploma course.

The major criteria for inviting others to contribute are possession of appropriate expertise in field or supporting work, and ability to communicate in a convincing and lively manner. Since the course members themselves possess teaching experience, it is important that the faculty should display good teaching ability. Selection of staff is on an informal basis and depends in part on their availability. Appointments are made annually. Advertising or interview is inappropriate since in many cases the university staff contribute without any additional payment and in no case is the fee paid large.

Since there is little if any remunerative reward a high level of personal motivation is usually ensured. Most of the faculty are themselves stimulated by the students' commitment to the course.

Many of those who contribute have shown that they have detailed specialist knowledge but are able to view this in the perspective of a wider general view of the environment. It is not always possible to make appointments of people who are able to think beyond their own discipline but it is an important element in consideration of prospective contributors. A few of those who work with the students are concerned with educational development rather than environment.

Balance between knowledge and teaching ability

Among those who contribute some are able to provide sound background knowledge. These are not concerned to any extent with the teaching situation. However, the most effective are usually those who not only have sound knowledge but also sufficient knowledge of the school situation to be able to suggest possible teaching strategies. It has already been mentioned that the contributors need to be able to convey their knowledge and understanding in a stimulating way to the students. In practice, the parts of the course related to work which might not have been usually included in school work are given by university staff who have little or no experience of school teaching. Although their teaching abilities vary most have proved capable of creating enthusiasm among the students.

Apart from general proficiency in teaching at this level, knowledge of school teaching methods is considered to be essential to some parts of the course. The historians, physical scientists, main geographer and course tutor are all able to both pass on subject expertise and to suggest a variety of ways in which the work may be approached in schools.

Non-university based professionals and others

As has been mentioned, a number of lecturers from the local college of education give assistance. These are all paid and times are arranged to suit them. In each case a series of meetings is provided. Particularly valuable contributions are made by a team from the history department who have developed a combined specialist interest in local history and by a physical scientist who treats the theme of "Energy".

In addition, one afternoon a week is devoted to contributions of a lecture and discussion nature and given by visitors usually from outside the university with knowledge of curriculum development, or to some interdisciplinary topic or to contributions by a visitor from one of the societies concerned with environment.

Other parts of the programme depend on co-operation from museum curators, the county archivists, farmers, social development officers, and many others. Two weeks are spent away from the Reading base. During these weeks staff of the Field Studies Council, other colleges and local people are involved in field teaching and field surveys with the students.

Co-ordination of the work of all those who contribute during the year is difficult. As many as possible are invited once a year to discuss the course but it is impossible to involve those who meet the students only once. The burden of relating the contributions and of briefing the contributors is

the course tutor's. This is done by letter, visits and discussion. The students themselves are able to integrate much of their work. Seminars and informal discussions among the students are valuable in this respect.

Throughout the period of preparing for the course and in its present early stage many people have been consulted. In particular, discussions have taken place with members of Her Majesty's Inspectorate of Schools, with officials and members of British and international organisations involved in environmental education, with school teachers, with examiners and with those involved in research related to some aspect of the environment. These discussions have been important in the design of the diploma course which has ultimately been the responsibility of the course tutor but which had to be approved by the appropriate committees of the University, etc., the University Senate, UCET and the DES.

Looking to the Future

It is unlikely that during the present university quinquennium any additional staff of the School of Education will be appointed to take up major responsibilities in the diploma course in Environmental Studies in Education. Ideally, it would be desirable to develop in the near future a team of enthusiastic staff with specialist qualifications and varied teaching experience of their specialisms and interdisciplinary courses in the classroom and the field. These need not necessarily all devote their full attention to the diploma course but should be appointed with this as part of their responsibilities. In addition, it would be of benefit to be able to arrange that most if not all the teaching were designed for the course participants rather than arranged for students on a number of courses at a number of stages of education.

With a larger number of staff involved in the organisation of the course more opportunities might be possible for field work which involved team co-operation of staff and students. At present too little interdisciplinary study in the field is organised because of the ad hoc arrangements for staffing.

More of the staff of the course should have not only high academic qualifications but also considerable school teaching and varied field experience. This team should include staff with skill in the fields of local history and the use of documents, geography and geology, agriculture, social study of communities, use of resources libraries, simulation and computers in teaching and in curriculum development. The staff need not hold identical views on the nature of environmental studies but should have sufficient

agreement to work harmoniously as a team and to be able to make balanced contributions to the course as a whole.

In the long term, it would be desirable to be able to construct a course allowing greater flexibility and choice of course units. Some of the staff should have followed postgraduate interdisciplinary courses in addition to possessing some of the skills outlined above.

Possibilities of developing a course at Master's Degree level may lead to further staff appointments.

2. INSTITUTIONAL ORGANISATION

Organisational base

It is desirable that an environmental study programme is not too tightly restricted by being based within a single department of the university. However, courses which are the shared responsibility of a number of departments are unwieldy and may flounder because of the difficulties of assigning staff, accommodation and finance, especially in a field of study in which maximum flexibility is required. For these reasons the position of the diploma in Environmental Studies in Education as one of the responsibilities of the School of Education is useful since there are no such conflicts. On the other hand, it is unlikely that this arrangement will permit of adequate specialist staffing and it will probably always be necessary to supplement the teaching by the goodwill of staff of other departments. The position of the course within the School of Education is also important in ensuring that a realistic view is retained of the teaching and learning situation existing in the schools. During the next few years the accommodation and facilities within the School of Education will become very good although there are some problems of providing books and other resources at an appropriate range of levels. This could be overcome by more co-operation with the local college of education and with teachers' centres.

Relationship with teaching and research facilities

Many of the staff who contribute to the course are involved in research on various environmental matters. In addition many visits are organised to university farms, the horticultural station, and to relevant government and industrial research stations. In this way students see research in progress and are taught by those who are working at the research front.

Although the School of Education has been actively involved in many recent developments in environmental education constraints of staffing

permit very little rigorous research in this area. A number of higher degrees are being submitted on subjects related to environmental studies in schools. These studies are supervised by staff of the School of Education.

Students of the diploma course meet during the course of their work other students from the diploma courses in Overseas Science Education and in Agricultural Extension and Rural Development, and in the Geography, Horticulture and Agriculture departments.

Relationship to Community at Large

There is no relationship to community at large except in that the co-operation of a number of public officials and industrial agencies is used in the course of visits and for occasional lectures.

Institutional constraints

The major constraints are the limits imposed by UGC grants on increases in staff. In addition both teaching and residential accommodation is limited so that it is unlikely that student numbers can be greatly increased. Provision of university transport would permit greater freedom for field work.

Use of other structures

As outlined above occasional use is made of the help of the staff of agricultural, forestry and various planning boards. This help does not occupy more than five days in the whole course.

Budget

Each year an allowance is made for the running of the course, related to estimates made by the tutor during the previous year. It is assigned by the Chairman of the School of Education from the overall money made available by the Committee of Deans of the University. The criteria used in assigning the money to the School of Education are related to overall university policy on its activities. Within the School of Education allocations are made in relation to predicted student numbers and estimates of the cost of various aspects of running of the course.

The items for which estimates are made include: part-time lecturers' fees; clerical assistance; subscriptions, periodicals and other publications; travel expenses of students and staff; field courses; miscellaneous equipment and teaching aids; maintenance of equipment; printing and stationery.

Strategy for introducing institutional innovation

New proposals for establishing a teaching programme are considered by a sub-committee with responsibility for courses at the level proposed. If approved, the proposals then proceed both to the Degree and Diploma Committee of the School of Education, composed of staff from the School of Education, the Registrar's Office and members of the staffs of the two Colleges of Education within the Area Training Organisation. Recently, a Staff Consultative Committee was established and new proposals are also examined by this and by the Professors to ensure that they are acceptable with regard to overall policy for development within the School of Education. If approved at this stage proposals then proceed to University Senate and the Committee of Deans.

Proposals related to teacher education have also to be submitted to UCET, mainly to ensure that national provision of courses is not excessive. If secondment of teachers to the course is required, the course proposals must also be approved by the Department of Education and Science.

Arrangements to serve different target groups

Within the course a limited amount of choice of course component is possible to permit the student to receive help in those aspects of environmental studies in which he has most need and to avoid repetition where he is already well qualified. Students are divided for seminars according to the school age group with which they are concerned.

In the future it may be necessary to make ad hoc arrangements for students with special requirements or unusual backgrounds. A number of overseas applications are being submitted and here special arrangements may be made for accepted students to carry out work which is selected from the components of the Diploma in Environmental Studies in Education and in Science Education for Overseas Educators. Most of these applicants are concerned with rural and particularly agricultural education.

Inter-institution co-operation and exchange

At present no such arrangements are foreseen except on an informal basis.

Advising and counselling of students

Responsibility for advising and counselling lies with the course tutor, although there is always the possibility of consulting the Chairman of the School of Education or one of the counsellors on careers guidance or within one of the university chaplaincies. Where health problems are concerned

students may visit the excellent health centre. The doctors working in the health centre have considerable experience in dealing with the kind of problems which arise when students are under stress.

3. COURSE CONTENT

Scope of environmental studies

This diploma course in Environmental Studies in Education necessarily differs from courses not specifically organised for teachers in that it includes consideration of professional educational issues as well as environmental studies themselves. These educational issues include reference to stages of pupils' development and teaching methods, curriculum development, methods of assessment, and resource storage and retrieval. Much of this work is conducted in seminars.

The environmental studies cover a wide range of subjects and interdisciplinary studies and investigations. Course members possess specialist knowledge but lack broad perspectives. A number of relatively elementary course components are available to supplement existing experience: meteorology; horticulture; animals of agriculture; variety of organisms; maintenance of organisms, with especial regard for homeostatic mechanisms; geography; geology; local history techniques; rural sociology; mathematical techniques. In addition, it is possible to attend more advanced courses in certain aspects, particularly in geography, biology and horticulture. A more integrated approach, often focused on environmental problems, is adopted in course components on Economics and the Environment, Natural Resources and Ecology, Making of Towns, aspects of physical sciences, field investigations and various workshop activities.

The purpose of the course is related to the needs of teachers who in turn are concerned with the needs of pupils, not of the environment. The fundamental purpose is to create both in the teachers and their pupils a greater understanding and sensitivity to the environment, with its complex interactions between natural, social and productive components. Incidentally, this may lead to a greater sense of responsibility but this is not considered to be of paramount importance in the context of this course.

The scheme is mainly biosphere-orientated. Since the course tutor makes a major contribution to this section of the teaching overall co-ordination of this area is more readily possible.

Man in the Biosphere and his impact on it is taught in a more fragmented way. Relatively little time is devoted to developing countries and more to

the ecological consequences of modern warfare. The Biology, Physical Science and Geographical and Geological work and integration is brought about in workshops and field work.

Little time is devoted to the impact of his environment on the physiological and psychological activity of man but in other respects considerable attention is given to the interaction of man with his environment today and in the past.

Three major problems arise in the organisation of such a course. One is the difficulty of integrating the work and co-ordinating the teaching of the components, especially when the timing of some of the contributions is related to overall university timetables, not to the needs of this particular group of students.

The second problem is that of achieving a satisfactory balance between taught courses, group work in classroom, laboratory or the field and individual study. Related to this is the third difficulty which is the challenge to provide intellectual satisfaction from a course which gives a broad coverage rather than involving study in depth.

Criteria for determining essential contents

It is considered that this course will only fulfil its objectives if the teachers attending it are able to introduce some of what they have learnt effectively in their subsequent teaching. For this reason, the professional and educational components are considered to be compulsory. In addition, it is held that it is essential that all students will have acquired by the end of the course some knowledge of the relevant aspects of biology, geography, geology, meteorology and physical science. No student is required to repeat a basic course in a field in which he already has experience.

Otherwise, each student is expected to attend at least some integrated courses and to gain wide field experience. Arrangements about attendance at other course components are decided on an individual basis, taking into consideration the student's work-load, previous experience and special interests.

Conceptual basis

Two major themes are developed throughout the course. These are:

i) Energy flow and circulation of materials;
ii) Interaction of man and environment.

These are seen to be related in that the interaction of man with his environment through his agricultural and other productive activities, through his

social organisation and the pattern of economic system that he adopts, affects the rate and direction of energy flow and the circulation of materials. Systems theory and models are introduced as ways of looking at the environment, especially with reference to the pattern of energy flow.

Integrating natural sciences with social sciences

Integration of the work of the course remains a problem but is overcome when themes are taken for discussion and detailed study, particularly in workshops and in field work. Otherwise, the process of integration is dependent on the interests and abilities of the lecturers involved and on the students' own efforts.

Use of illustrations, local, regional and global

Field work and visits are organised locally to consider specialised situations such as a particular habitat or a built-up area, to examine the work of a relevant research organisation or public services. Two weeks are devoted entirely to field study. One of these examines factors contributing to the character of a particular rural region in which agriculture and extraction industries are traditionally the major activities but in which tourism is now more important. Future policies for developments in the area are examined critically. The other region is urban and comparisons are made of different districts as well as examining the history, present and likely future activities within the region. Both these field weeks give ample opportunity for integrated work.

Comparisons are made with a variety of overseas situations, in Europe and developing countries, but much of this is incidental rather than consciously incorporated. International problems are introduced where appropriate. From time to time teaching is provided by people from overseas and a number of the lecturers have much experience of other regions of the world. Some reference is made to international legislation and organisations.

4. TEACHING METHODS, MEDIA AND MATERIALS

Relation to contents and objectives

Since the whole of this course is concerned with environmental studies within schools, a variety of teaching and learning approaches are involved, in part as an example to the course members. However, if a broad coverage is to be provided it is necessary to use lecture methods in a considerable proportion of the course. In addition, film is used to help in considering possible teaching methods.

Methods used for multidisciplinary and interdisciplinary aspects

In many cases this part of the work is developed by the course members themselves working as a team in carrying out an investigation, discussing it, making further studies and then conferring once more. Sometimes this kind of work involves analysing an environment, sometimes drawing together ideas and, at other times, leads to the preparation of teaching schemes and materials.

On the field weeks and on other occasions several people co-operate as a teaching team. This is not easy, especially when those concerned come from different institutions, and it depends on there being a fairly even balance in assertiveness of the team members and in there being considerable mutual respect as well as agreement on objectives. Discussion and careful planning are essential.

Innovations required

Although lectures and seminars are important, workshops and field studies in which lecturers and students work as a team either using their especial expertise or learning to follow new methods together are particularly valuable. Ideally, these should be supported by able technicians but finance does not permit much assistance of this kind.

For much of the more elementary work, the students' backgrounds are so varied that individual learning methods would be ideal. Programme methods would be useful. These could be multimedia and so that students did not remain passive. Some multimedia resources are available but are not ideal for this group of students.

Non-classroom learning experience

This part of the programme is very varied and includes:

i) visits to research establishments, industry, archive collections, museums, farms and various public services, where some form of exhibition or conducted tour is provided. The best results are obtained when considerable discussion has been involved beforehand between host and teaching staff.

ii) day or half-day visits to urban or rural sites for an organised tour involving much instruction in the field.

iii) day or half-day visits to urban or rural sites accompanied by staff to conduct a survey or experiment in the field.

iv) day or half-day visits to urban or rural sites with or without staff to explore the area for its interest and especially to examine it for possible approaches to study in schools.

v) two weeks' field study examining areas in depth.

vi) individual investigations. Each student carries out an individual study, which will usually involve field work, for purposes of overall assessment.

Wherever possible quantitative as well as qualitative techniques are employed. Areas selected provide opportunity for both large scale and very detailed studies.

Role of laboratory experience

Laboratory work is used as part of an enquiry approach to the learning of the scientific components of the course or to illustrate particular aspects. It is also used to develop new approaches to such aspects as monitoring the changes of microclimate in an enclosed situation, to investigations on soil or ways of conveying ideas on population changes.

Use of and access to computers

Although computer terminals and a variety of computing systems are available these have not been used. It is envisaged that they will only be used if pertinent to a particular individual's study. Simple statistical techniques are taught in relation to particular problems which might arise in field study.

Utilising others' experiences

Films, videotapes and other audiovisual materials are used to examine teaching methods, and to gain from the studies of others in contrasting regions or with a more global perspective. Role playing and case studies are examined more as a method of teaching than used for learning immediate course content. However, there is much incidental learning which the students achieve at their own level, in examining examples for their educational potential.

Rationale for methods used

Since the backgrounds and particularly the specialisms of those attending this course are so varied, they themselves have much to contribute and consequently discussion through seminars and very informal lecturing methods is of great value. Equally, any teaching or learning situation which helps the

course members themselves to develop a more flexible approach is favoured. Consequently, much initiative is demanded from the students, especially as assessment of the course is through a number of pieces of independent study, not through examinations.

However, it is considered that students should become familiar with the language, approach and techniques of a wide variety of disciplines, and this requires more rapid and guided coverage than is possible with discussion and many individual learning methods. Here lectures and more formally organised laboratory and field study are utilised.

Approaches which are particularly successful

The most valuable approaches are those where study or investigation is followed by discussion leading to further investigation, often in a team. Seminars and workshops are valuable. Films are a useful substitute for classroom observation and have the merit of directing observations so that all the students see and so can discuss the same points.

Methods of evaluating student progress for various non-classroom learning components

Each student leads a number of seminar discussions throughout the year. Some of these arise from a field study, and the quality of observation, analytical ability, and imagination revealed can be assessed not only for the person leading the discussion but also for other members of the group. This assessment is done informally, not on the basis of graded scales.

Each student is required to carry out an individual investigation which is interdisciplinary in nature and which is written up in a formal report. Also, each course member presents a teaching scheme using a specified field study as its basis.

Methods of assessing educational materials

One of the functions of the course is to examine teaching aids. For this reason, a wide variety of aids can be used in any one year and the course members will form part of the assessment team as far as effective presentation is concerned. With regard to content, the expertise of colleagues is used in assessing quality. Comments from reviewers are also taken into account. No formal scheme of assessment has been devised.

5. RESEARCH BASE

Many of the lecturers and others who contribute to this course are involved in research on environmental matters. However, there is no formal programme of research into problems of environmental interest within the School of Education. There is research in progress into environmental education in various sectors of the educational system. In addition the Council for Environmental Education has its secretariat and its Information and Advisory Service based in the School of Education. The Council is a national co-ordinating body with committees concerned with schools, higher education and with resources. The Information and Advisory Service is concerned with the assembly and dissemination of information. New information and perspectives are continually being made available and are built into subsequent work.

The University of Reading has a reputation for research in many aspects of environmental study and in particular the Faculties of Urban and Regional Studies and of Agriculture are concerned with problems which have a broad coverage, rather than requiring a mono-disciplinary approach. Both kinds of research are necessary but it is harder to achieve high standards of investigation and reliable interpretations when many factors are involved. Several departments are conducting basic research within traditional disciplines which contributes insight into larger issues.

The other points raised under this heading do not apply to the diploma course within the School of Education.

6. CRITERIA OF SUCCESS

The major criterion of success is the response of the students within the course and their work within education on leaving the university. Here, evidence is sought for students having achieved a more balanced, less emotive and more informed view of the environment, having developed greater versatility as teachers and having gained more insight and vision into ways of achieving understanding of the environment through the educational system both in their own teaching situations and within the whole formal and informal educational provision of this country. Related to this is the personal satisfaction of the students during the course. However, this is only taken as a subsidiary means of assessing success, since there are many extrinsic factors which influence the students' immediate response at a particular instant during the course.

Performance of students in their formal assessment is important. The reports which students submit indicate to what extent they have achieved a

wider perspective, new understanding of educational issues and ability to apply their new skills both in environmental study and in teaching situations. During the course students are watched to ensure that they are acquiring new knowledge, skills and understanding.

The course is in its second year. Numbers of applicants are influenced by the attitude of local educational authorities to secondment on a one-year basis. Although numbers and quality of applicants do give some indication of success of the course this is only valuable in long-term assessment and cannot be regarded as very reliable. The number of enquiries received is an indication of interest but not of success and in any case is likely to decline once knowledge of the course becomes widespread. In the long run new students will be recruited only if the course is seen to be valuable by both the former students and by the local educational authorities who employ them.

The fact that the Council for Environmental Education has moved to Reading is encouraging but is not related entirely to the presence of the diploma course. It was also attracted by the other departments within the university which are concerned with the environment.

7. RECURRENT EDUCATION

It is fortunate that recent publications on the future of the teacher-training programme have emphasised the need for teachers to be released for further study at intervals throughout their careers. Official support and the provision of secondment arrangements on full salary seem the only way of ensuring that all career professionals consider the possibilities of recurrent education.

There are great personal sacrifices involved for many who undertake part-time or full-time education when they are already established in their careers. Travel, time, separation from family and home and difficulties in achieving satisfactory study habits are all involved and here sympathetic tutorial help is essential. It is important that those who co-ordinate courses for recurrent education should be sensitive and responsive to the needs not only of the individual members of the course but to the needs of the profession or section of the community from which students are drawn.

One of the major problems is to make the course widely known to those who may be interested and to local education authority officials, head-teachers and others who make decisions about the release of teachers. Not only must they be informed of the existence of the course but they must realise the need for the course. Advertisement, articles and wide contacts are all important.

Teachers form critical students and so teaching proficiency is a high priority in selection of staff for the course. As has been indicated course content and teaching methods are influenced by the kind of course participant. Active learning situations are probably of paramount importance for older students whose powers of concentration may be limited and whose memories may be deteriorating. On the other hand these students' considerable experience can be used in decision-making. Any attitude of condescention on the part of those who teach the course is quite unacceptable. In any case, most of the lecturers comment on the responsiveness of the students.

Problems of recurrent education for teachers arise because many do not require full year courses but would benefit from term courses. Courses based in universities may lack flexibility because of the rigid degree, diploma and higher degree structure which precludes making adequate arrangements for those who need opportunity for further study within an establishment of higher education but who for various reasons are unsuited for submission for an award.

Northumberland College of Education

DEPARTMENT OF ENVIRONMENTAL SCIENCE

Newcastle upon Tyne, UNITED KINGDOM

by

L. O'DONNELL, Professor

At this college all students are training to be teachers. They choose to be trained particularly for one of the age ranges 4-11, 9-13, 11-16 years, though in fact they often take up posts outside their nominal age range. About three-quarters of the students stay three years on a Teachers' Certificate course involving one Main Course subject, Education, Practical Teaching, and a variety of Curriculum courses in subjects other than their Main Course subject. About one-quarter stay four years on a Bachelor of Education (B.Ed.) degree course involving two Principal Level subjects, Education, Practical Teaching, and Curriculum courses.

Most full-time students enter directly from school at about 18 years of age, but about ten per cent are of various ages up to 45.

In addition the college offers a two year in-service B.Ed. degree course for serving teachers. The first year is a part-time evening course, and the second year is the final fourth year of the full-time course.

1. WHO DOES THE TEACHING?

a) There are six members of staff, with the following qualifications:

- B.Sc.(Chemistry), M.Ed.(Philosophy of Education + Technical Education), M.Inst. Phys., L.R.I.Chem.,
  Previously: Junior, Senior, Grammar Schools.
- B.Sc.(Forestry), M.Sc.(Ecology), M.I.Biol., A.S.For., Dip.For.
  Previously: Grammar Schools, Field Centre Warden.
  Activities: National Parks Voluntary Warden. Civic Trust Committee.
- Teachers' Certificate, Dip.Advanced Educational Studies (Primary Education), Diploma in Education of Handicapped Children.
  Previously: Secondary Schools, Camp Schools, Schools for Retarded Children.
- B.A.(Sociology), Dip.Rural Education, Royal Hortic. Soc. Teachers' Certificate.
  Previously: Secondary Schools.
- B.Sc.(Botany and Zoology), M.Sc.(Zoology), M.I.Biol.
  Previously: Comprehensive Schools.
  Activities: National Parks Voluntary Warden. Chairman, Parent/Teachers Association.

- B.Sc.(Physics and Maths)
  Previously: Comprehensive and Grammar Schools.

b) Criteria for joining department: one or more of:-

- Desire to move from narrow single subject science teaching to broader-based course.
- Scope for field work greater.
- Natural progression from school teaching to teacher training.

c) All staff are professionally qualified teachers and all have school teaching experience.

d) Other professionals.

i) From other departments in the college.
P.E. Joint course of outdoor pursuits and environmental science.
Maths. Elementary work on Modern Maths including use of calculating machines.
Audio-visual education. Use of CCTV and other audio-visual equipment.

ii) Visiting lecturers.
Nature Conservancy.
Water pollution treatment unit.
University School of Agriculture.
County Planning Department.
Visiting lecturers do not become involved in curriculum development.

e) Looking to the future.

The main obstacle to progress is the refusal of many academics in universities, colleges and schools to accept Environmental Studies/ Environmental Science as being a legitimate study. The status of the subject(s) is/are low compared with single subject disciplines. The skills, knowledge, and experience that should be sought are relatively unimportant compared with an attitude of mind which is prepared to learn and teach from direct experience.

2. INSTITUTIONAL ORGANISATION

a) Organisational base

The Institute of Education of the University of Newcastle upon Tyne consists of the School of Education of the University and four local Colleges

of Education separated geographically and administratively from the University.

The Department of Environmental Science at Northumberland College is the only science department in the college. It offers a Main Course at Certificate level, a Principal Level course at B.Ed. degree level and curriculum courses to students in other Main Courses. It does not offer any other science course; other colleges in the Institute offer single subject and double subject science courses. The only other College of Education offering Environmental Science in England is Portsmouth.

b) Relationship of this base to teaching and research facilities within the University, and other organisations

The Science Committee of the Institute of Education of Newcastle University consists of members from all Science departments of all the colleges in the Institute and it approves all new syllabuses and amendments to existing syllabuses. There is no interchange of staff or students between colleges or the University.

c) Relationship of this base to community at large

There are no direct links between our college department and the community at large other than those with teachers in schools in which college students do teaching practice during each year of study.

d) Determination of Budget for programme

Available college finances are divided by agreement of heads of departments and the Principal.

e) Strategy for introducing institutional innovation (if necessary) for establishing programme

Innovations in the teaching of Environmental Science are, initially, by departmental staff consultation. A staff/student committee meets each term to discuss all aspects of academic and organisational problems.

f) Advising and counselling of students

Each college tutor has about twelve personal students. His function is to advise directly or to suggest sources of advice for all activities of his personal students, academic and social.

3. COURSE CONTENT

a) Scope of "environmental studies"

It is agreed that there must be both breadth of vision and satisfactory depth of study.

Basic Curriculum

A. Preliminary Remarks

i) Our scheme is based on an integrated approach with analysis of the component parts.
ii) Our scheme is "Biosphere oriented" in the same sense as defined by Bossanyi.
iii) Selection is inevitable.
iv) We have found it essential to keep the syllabus flexible. No course has yet been the same as the previous years'.

B. Basic Content

. The Biosphere

i) Maintenance and control processes.
ii) Processes causing or involved in change over periods of time.
iii) Correlations and interdependence of different processes and phenomena.
iv) Energy considerations.

Elementary statistics is studied but there is no work on computerisation.

. Man in the Biosphere

Study of observed environmental effects in Northumberland, Kent, and the Black Isle of Scotland due to:

i) Magnitude of human interference.
ii) New methods and new materials used by man.
iii) Rate at which new developments take place.
iv) Artificial simplification of ecosystems by man.

A brief study of contemporary global resources and a simple study of wastes, their disposal and pollution effects.

. Environment and Human Society

Only the direct physical and biological aspects of the following topics in this section are studied.

- Environmental factors contributing to the rise of agricultural, urban, and industrial societies.
- Man made changes, afforestation, deforestation, agriculture, urban development, pollution.

(Social, cultural, medical, and psychological effects receive little attention).

. Policies and Methods for Action

Here again the emphases are largely physical and biological.
Conservation of habitats, wildlife, soil.
Pollution control.
Environmental and resource planning and management.
Relevant organisations at local and national level.

Levels of Study

Students enter the department with a wide variety of backgrounds and with a wide variety of abilities. In the first year there is a common course for Certificate and Degree students with Degree students having additional work. For subsequent years Certificate and Degree students are taught separately. However, in both courses there has to be a considerable degree of flexibility, as in any topic under discussion there will be, in the same group, those who have never studied the topic before and those who have come across it in an "A" level G.C.E. (general certificate of education) course. The aim is to give all students a clear overall "awareness" course and to give each student an opportunity for study in depth in several contrasting areas of science. It follows that it is not expected that all students will study all parts of the course to the same depth.

Location of Higher Environmental Education Courses

It is agreed that environmental education courses should be run by one department in an institution which has other departments. This is the organisation at our college, where certificate, degree undergraduate, and serving teachers' courses are offered.

The department does not offer Adult Education courses; Newcastle University has a Department of Adult Education.

International Aspects

One member of the department has spent a year at the University of Colorado, USA. Visiting tutors from the Universities of Colorado and Illinois,

USA, and of New Brunswick, Canada, have spent periods varying from one term to one year with us.

We have full-time in-service undergraduate students from various Commonwealth countries at present studying in our department.

Up to the present we have had no exchange of mutual recognition of courses.

b) Criteria for determining "essential contents"

It is the opinion of this department that all the many topics which are found in the published syllabuses of "Environmental Studies" fall naturally into two easily recognised subjects which can be called "Environmental Science" and "Environmental Humanities", though, of course, there is no precise dividing line between them.

The whole subject of "Environmental Studies" is too broad for Colleges of Education, and attempts to teach it as a Main Course or B.Ed. subject lead only to superficiality.

The subject "Environmental Science" is viable since:-

- it has a clearly recognisable core,
- it can be logically structured with flexible relationships,
- it can draw students by natural progression from Science Sixth forms,
- it can prepare teachers for posts which are available in primary, middle, and secondary schools, where they are more valuable than teachers trained in single science subjects.

There is a place in Colleges of Education for "Environmental Humanities" to draw students largely from the Arts Sixth forms and to train students in a course parallel to "Environmental Science".

The ideal training would be in both these subjects at the same time, one being complementary to the other.

This department is an "Environmental Science" department and the primary criteria for the inclusion of areas of study in the course are:-

- that they should be capable of investigation scientifically,
- that they should be capable of investigation environmentally, that is, from primary sources.

We have allowed some latitude in both cases, since the personal enthusiasms of individual tutors and students should be fostered.

In selecting areas for depth studies an attempt is made to ensure that all areas of science are offered and that each student makes a balanced choice.

c) Conceptual bases for organising multi-disciplinary or interdisciplinary "core" of programme

The course in this department is not developed in themes or concepts.

d) Integrating natural sciences with social sciences

The social sciences play only a small part in our scheme of work and occur only where they appear naturally in a physical or biological context.

e) Use of local/regional illustrations and on-site demonstration

The range of our illustrations is on three levels:-

. In and around the college site.
. In selected localities in the county of Northumberland.
. Field weeks in contrasting environments in the South of England and the North of Scotland.

f) International or global perspective

Little work is done on international or global perspective.

4. TEACHING METHODS, MEDIA AND MATERIALS

a) Related to contents and objectives

Teaching methods are based on two objectives:-

. The personal education of the student in science as a cultural subject.
- The directing of the attention of the student to the teaching of Environmental Science in schools.

b) Pedagogical methods

The courses follow this pattern:-

i) Content of environment. Ecological techniques. Direct investigation. Problem finding and problem definition. This part of the course is taught by the tutors as a team.

ii) Basic science information, techniques, and experimentation. Models and theories in science. This part of the course is taught by tutors individually or in pairs using their own specialisms but employing as much of the investigational method as possible. The following area specialisms are used; Earth Science, Biological Sciences, Physical Sciences, Horticultural Science, Animal Science.

iii) Return to environmental investigation. At the end of each year a field week is given over to investigational work. Team teaching.

iv) Further science study in the field and in the laboratories to increase knowledge and understanding. Specialist tutors.

v) Environmental management. Interaction of man and his environment. Urban and rural environments.
Team teaching, individual tutors, and visitors.

vi) Environmental problems. Food. Population. Seminars, Symposia. Visiting speakers.

c) Innovations required compared to classical pedagogic techniques

There are very few formal lectures. Almost all the work is done as investigational or discussion sessions, indoors and outdoors, under the direction of the tutors who introduce the appropriate theory not in set lectures but as part of the normal sessions.

d) Methods used to provide for non-classroom learning experience

As much profitable field work as possible is done. Travel time is reduced to a minimum. Work in the county is done on weekend courses or on whole day trips locally.

e) Rationale for different teaching/learning methods used

It is difficult to outline briefly the rationale for the teaching/learning methods used; it is a composite blend and probably owes most to:-

- J.S. Bruner and associates (see "The Process of Education").
- The directors of the various Nuffield science teaching projects.
- R.W. Colton, the first head of this department, recently the director of the Schools Council Project Environment, and now on the staff of the University of Colorado, USA.

f) Methods of evaluating student progress

Evaluation of student progress for various non-classroom learning components is by:-

- Field notebook inspection.
- Written questions and answers.
- Tutors' subjective assessment.
- Final practical and written examinations.

Individual tutors assess their own educational materials and use whichever they wish. Many of the slides and tapes used are produced by the tutors themselves.

5. RESEARCH BASE

There is no research work being carried out in the department. Individual tutors are involved in their own second degree, advanced educational diploma, and Open University degree, courses.

6. CRITERIA OF SUCCESS

a) Enrolment of students, proportion graduating

About twenty-five to thirty students register annually (all intending teachers) in the Department of Environmental Science. About one third proceed to a B.Ed. degree and two thirds to a Teachers' Certificate. About five students fall out of each year group before the end of the course.

b) Recruitment of staff

There are six staff. In nine years there have been five changes and there has been no difficulty in finding replacements.

c) Employment and how far it is attributable to training received

There is ample evidence that there are plenty of posts for students leaving the Department of Environmental Science.

7. RECURRENT EDUCATION

The very good response to the in-service B.Ed. course suggests that one of the best encouragements to serving teachers to seek recurrent education is to offer degree courses to non-graduates.

The University of Michigan

SCHOOL OF NATURAL RESOURCES*

Ann Arbor, Michigan, UNITED STATES

by

P. M. SANDMANN, Assistant Professor

* This description is abstracted, with permission, from a provisional draft.)

People have the power to change their environment, and their relationship to their environment, for better or for worse. This environmental behaviour is influenced by our knowledge and skills; by our attitudes and values; and by our political, economic, and social systems. All these things, too, can be changed.

This is the central insight of environmental education. It reflects a growing conviction that improving the environment is not only a matter of studying ecosystems more closely and devising new techniques for managing forests, wildlife, and chemical pollutants. The management/technology perspective is essential, but it is not enough. In their role as experts, environmental managers tend to pay too little attention to the importance of individuals, the influence of political and social systems, and the impact of attitudes and values. Environmental education puts its greatest stress on these forgotten dimensions.

It is not enough, in other words, for professionals to know how to cut down on automobile exhaust emissions. Ordinary people, young and old, must be able to reach the professionals, to tell them what changes in car design and cost are tolerable. They must have access to political leaders as well, to influence automotive legislation and regulation. And they must re-examine their own car-buying and car-driving behaviour for its environmental implications. If an alternative to the automobile is to be introduced, ordinary people must be in a position to help determine the choice of a mass transit system, its political and economic arrangements, and its impact on their life-styles.

The effort to train environmental professionals who are more responsive to the needs and wants of lay people is consistent with these goals. But individual citizens can do their part as well. They can acquire the knowledge, skills, values and motivations they need to reach wise stands on environmental issues and to turn those stands into action.

If these things are true of the biophysical environment, they are even more true of the cultural and social environment. Conceivably some temporary amelioration of air and water pollution is possible without attention to individual behaviour, social systems, and underlying values - though clearly any long-term solution must incorporate these dimensions. But what about

housing, population, and the quality of urban life? The experience of the past decade demonstrates the futility of attacking these crucial environmental crises through purely technocratic strategies. Unless ordinary citizens become involved in these issues and achieve the technical knowledge and political skills necessary to make their involvement count, the urban environment can only continue to deteriorate.

An environmentally literate citizen, then, is a person who is:

Knowledgeable concerning the environment and its current degradation at the hands of the people;
Skilled in the ecological, managerial, psychological, socio-political, and economic techniques of environmental improvement; and
Motivated to employ these techniques in a lifelong pursuit of environmental quality for all living things.

The goal of environmental education is to produce such citizens.

An environmental education student is assumed to be a person who wants to become environmentally literate and wants to help others become environmentally literate - through teaching, mass communication, community organising, or some other strategy or combination of strategies.

1. WHO DOES THE TEACHING?

At the University of Michigan environmental education is centred in the School of Natural Resources (SNR). Administratively (especially on the graduate level) it is part of the Environmental Education and Outdoor Recreation Program (EEOR), one of six formal programmes in SNR. The other five graduate programmes, whose courses and faculty are readily available to environmental education students, are: Fisheries, Forestry and Wildlife; Landscape Architecture; Resource Ecology; Resource Policy and Administration; and Resource Systems Management.

As the six programme names imply, SNR embraces both natural and social sciences, as they are used in the study and management of natural resources. Less applied approaches to ecology may be found in the Departments of Botany, Geography, Geology, and Zoology, all part of the College of Literature, Sciences and the Arts (LS&A). Other units of LS&A of special interest to environmental education students include Economics, Journalism, Political Science, Psychology, Sociology, and Speech Communication. Courses relevant to environmental education are also offered in the Schools of Architecture, Business, Education, Engineering, Law, and Public Health; and in the interdepartmental Urban and Regional Planning Program.

Of the seven faculty in EEOR, three are devoted to out-door recreation. The four faculty members specifically in environmental education have further divided themselves into three areas of emphasis: Bill Stapp in environmental instruction; Pete Sandman in environmental communication; and Bunyan Bryant and Jim Crowfoot in environmental advocacy. Although instruction, communication, and advocacy are not formal departments within SNR or EEOR, course requirements vary across the three options, and students are asked to choose one when applying.

How do the three options differ? The simplest explanation is that instruction trains mostly teachers, communication trains mostly writers, and advocacy trains mostly social change agents. In a deeper sense, however, all three options are concerned with social change, and their differences are largely a product of the individual interests of the faculty.

The instruction option puts the greatest stress on developing, implementing and evaluating environmental curricula for primary and secondary schools, and for other education-related organisations. It is designed for students who want to improve the environment by helping young people learn new environmental knowledge, skills, and motivations.

The communication option stresses mass audiences and the use of communications media for environmental persuasion and planned attitude change. It is designed for students who want to improve the environment by convincing others to interact with the environment in new ways.

The advocacy option puts its emphasis on the relationship between environmental quality and social justice, and how to change political institutions through interest-group activism. It is designed for students who want to improve the environment by organising interest groups to fight for their environmental needs.

The differences among the three options should not be overemphasised. Instructors often need the skills of persuasion and organising; communicators should know how to teach and to organise interest groups; advocates frequently have to instruct or persuade their constituencies. All three options are committed to the role of ordinary people, social systems, and values in environmental improvement. Our similarities are more important than our differences, and we work closely together.

2. COURSE CONTENT

a) Undergraduate Curriculum in Environmental Education

There is no formal undergraduate major in environmental education at the University of Michigan. Within a broad structure of area requirements under-

graduates in SNR are free to develop individualised programmes in any of three general fields - environmental studies, environmental sciences, or environmental management and planning. All culminate in a B.S. degree in natural resources.

SNR undergraduates may major or minor informally in environmental education or any of its three programme options simply by developing their programme of study in consultation with the appropriate faculty member. The environmental education faculty is enthusiastic about such informal arrangements, and believes that most students can plan a curriculum that meets their needs within the constraints of SNR requirements. In addition, a formal major in environmental instruction, leading to a teaching certificate, is offered jointly by SNR and the School of Education.

Six courses in environmental education are open to University undergraduates regardless of their major. In instruction: NR 480*, "Community Environmental Field Studies", and NR 481*, "Environmental Education Seminar". In communication: NR 376, "Mass Media and the Environment", and NR 476, "Writing about Environment". In advocacy: NR 483, "Planned Social Change and Environmental Problems", and NR 484, "Minicourse in Social Change Skills".

b) Graduate Study in Environmental Education

Roughly 35 graduate students are enrolled in environmental education. About 25 of these are candidates for the M.S. degree in natural resources, offered through the Rackham School of Graduate Studies; the remaining students are enrolled in the Ph.D. programme.

Completion of the master's degree normally requires two years (four semesters) of work. Approximately 12 new masters students are admitted each year, four in each programme option. Admission is usually for the fall semester (early September), but winter and summer admissions are possible.

The purpose of the masters curriculum in environmental education is to help students become practising environmental educators - that is, environmental instructors, communicators, or advocates. To assure that some graduates will be able to work with particular constituencies, and that all graduates will be familiar with the perspectives of a wide range of constituencies, the faculty has adopted admission criteria that stress diversity of race, sex, and experience. In this way each student brings to the programme a unique background and viewpoint that contributes to the education of other students.

Aside from diversity, masters students normally (but not invariably) enter the programme with an undergraduate grade point average of 3.0 or higher.

---

* See Annex.

Some real-world experience relevant to environmental education is considered desirable apart from undergraduate training. In addition, a basic foundation in five disciplines must usually be acquired either before or after entering the programme; this consists of one course each in ecology, economics, political science, behavioural science, and research methods.

Curricula in the three programme options in environmental education share several common threads. First, all entering students in environmental education are required to take a team-taught core course, NR 600, "Environmental Education and the Concept of Values". Second. all three options require a minimum of three courses in environmental sciences - defined broadly to include resource and human ecology; resource and welfare economics; resource policy, management, and law; etc. Third, all students participate in guided real-world "work-study" experiences as instructors, communicators, or advocates (this requirement may be waived for those with appropriate work experience). Fourth, all three programme options attempt to generate a rich learning environment of informal seminars, non-credit workshops, and the like, in which students are invited and expected to participate.

A masters thesis or practicum is optional in environmental education. The thesis programme totals 24 credit-hours of courses and work-study, plus 6 credit-hours of thesis, plus prerequisites that are completed after entering the programme if deficiencies exist. The non-thesis programme totals 36 credit-hours of courses and work-study, plus prerequisites if deficiencies exist.

The individual programme option curricula described below are open to modification. They constitute our current sense of what most students ought to do and are doing.

Environmental instruction

This option is designed to assist students in acquiring greater knowledge and skills in developing, implementing, and evaluating environmental education programmes in public and private school systems (K-12), youth organisations, para-schools, and other education-related organisations. Such instructional programmes are normally aimed at: assisting the learner in analysing and clarifying personal values concerning the environment; increasing the learner's interest and sensitivity towards the environment and its problems; and helping the learner develop social skills necessary to effectively activate channels towards change. The instruction option is designed to assist students to acquire the background to implement such programmes.

Environmental communication

Persons specialising in this area should enter the programme with considerable competence in at least one of three disciplines: communication

skills (writing, graphics, broadcasting, etc.); communication theory (social psychology, persuasion, media processes and effects, etc.); or environmental sciences (ecology, resource policy and economics, etc.). The option attempts to build competence in all three disciplines, to aid the student in becoming a proficient practical communicator on environmental topics. The overall goal of the option is to learn to change the attitudes and behaviour of relevant publics vis-à-vis their environment, and thus contribute to environmental quality through communication.

Environmental advocacy

Specialisation in this area includes analytic and behavioural skills in changing social systems, and value analysis and clarification with regard to advocacy as a means of planned social change. A high priority is placed on understanding the environmental problems of groups least served by the present socio-political system. Major emphasis is placed on the ways in which individuals, groups, corporations, and governments can be made more responsive to social and environmental conditions. Students in this option concentrate in the areas of environmental science and social change and advocacy. This concentration includes work on values, analytic understandings, and behavioural skills.

Resources

Financial aid for environmental education students comes from many sources: from University, SNR, and EEOR grants; from government and foundation grants; from teaching and research assistantships and fellowships; from funded work-study projects and other relevant employment; and from part-time jobs on and off campus. Taken together, all these sources of aid are not always adequate to meet the needs of environmental education students.

Financial aid administered by the University and SNR is awarded chisfly on the basis of academic excellence; special grants are also available for minority students. Financial aid administered by EEOR is awarded chiefly on the basis of need - the student's need for money, and the programme's need for the student. The overall commitment of the environmental education faculty is to support students near the end of their degrees first. Thus, relatively little aid is available for incoming students.

So far we can accurately boast that no enrolled student in environmental education has yet been forced to leave due to lack of funds. But several have come close.

c) Doctoral Curriculum in Environmental Education

Environmental education offers a Ph.D. in natural resources through the

Rackham School of Graduate Studies. In theory all doctoral students in SNR are "at large" and not associated with a particular programme. Nevertheless, each prospective doctoral student must be endorsed by a faculty member who agrees to become that student's adviser; thereafter the student is informally associated with the programme in which his or her adviser teaches. Environmental education carries approximately 10 doctoral students at a time, accepting only two or three per year for all three programme options.

With rare exceptions the Ph.D. degree is research-oriented rather than practice-oriented. That is, it is designed to train scholars, researchers, and teachers, rather than practitioners, in the areas of environmental instruction, communication, and advocacy. In view of society's pressing need for practitioners in these areas, the environmental education faculty does not intend to expand the doctoral programme beyond its current size. Students with a master's degree in another field may want to consider applying for a second master's instead of a doctorate.

3. CRITERIA OF SUCCESS

Job opportunities in Environmental Education

As the longest-established curriculum and discipline in environmental education, the instruction option offers plentiful and relatively clear-cut job opportunities for its graduates. B.S. and M.S. graduates may work as teachers or curriculum co-ordinators for school systems, or as education specialists for related institutions - state departments of natural resources or education; federal agencies: local, regional, and national private organisations; etc. In addition to these opportunities, Ph.D. graduates may teach on the college and university level as well.

Job opportunities for communication and advocacy graduates are not nearly so well defined. Communication students may find employment as environmental specialists for mass communication industries, as information specialists for environment-related government agencies, or as public relations specialists for corporations or non-profit environmental groups. Advocacy graduates may find work within established institutions such as corporations and government agencies, or with neighbourhood organisations or emerging coalitions on the local, state, regional, or national level.

Although society's need for environmental instructors, communicators, and advocates will clearly continue and increase in the years ahead, it is by no means clear how soon employers will come to perceive the need. Nor is it obvious that all those who do see the need will have the funds to meet it. Many students may find themselves having to develop - with difficulty - previously non-existent job niches.

Annex

CORE COURSES IN INITIAL TEACHER EDUCATION

NR 480 Community Environmental Field Studies

A course designed to study under field conditions certain environmental issues that are common to most community environments, such as land utilisation, recreation, air and water pollution, transportation, housing, and environmental planning. Each issue will be examined from an ecological, economic, political, social, and technological point of view. One hour of classwork is scheduled in connection with each field trip in preparation for, and analysis of, the experience.

NR 481 Environmental Education Seminar

To provide a conceptual and philosophical understanding of the emerging field of environmental education with special emphasis on the following:
The role of the teacher in creating a learning environment, values and teaching, attitude formation and change, handling controversial issues, principles of curriculum development, available instructional aids and techniques in utilising them, school site planning and utilisation, and strategy for developing and implementing environmental education programmes.

Part Two

DECISION MAKERS

INFORMATION SEMINARS FOR SENATORS OF THE REPUBLIC

ITALY

by

V. GIACOMINI

INTRODUCTION

The idea of information seminars or short courses on environmental matters for "decision-makers" has always seemed difficult to put into effect. For this reason an Italian initiative - perhaps not perfect or exemplary, but certainly significant - may seem of special interest. This initiative came from above, from one of the highest authorities in the Italian State, and was directed at a specially high category of decision-makers: Senators of the Republic.

Senator Amintore Fanfani, President of the Senate, back from the USA, undertook to interest the Italian Senate in environmental issues in order to promote an environment policy to meet the country's needs. He was certainly influenced by the example of President Nixon, and possibly even more by having seen the magnificent conservation achievements of the USA in creating the famous National Parks. Realising that political circles in general were uninformed about ecological problems and conservation principles, he thought it would be useful to offer Senators a proper course of lectures given by university teachers and experts of acknowledged competence.

Senator Fanfani's aim was to set up an Orientation Committee on ecological problems, which would be able, after a short concentrated course, to initiate in the Senate sound legislation on environmental matters. After consulting the Chairmen of the Commissions for Agriculture, Public Works, Industry, and Health, and having obtained the favourable opinion of the Conference of Vice-Presidents of the Senate and Chairmen of the Parliamentary Groups, he in fact proceeded to set up this Committee on 26th February 1971 with the following tasks:

- To bring the Senate up to date about the conclusions reached by scientists on:
    a) the degree of disturbance and the risk of further deterioration in the natural balance;
    b) the prospects of worse tension between man and the natural environment;

c) the remedies for damage already done and the preventive action still possible.

- To bring the Senate up to date about the action now being taken to cope with these problems:

  a) by the Italian Government;
  b) by other Governments;
  c) by the Community and Associations of States (especially the Council of Europe and the EEC);
  d) by the U.N.

- To bring the Senate up to date about the procedures likely to permit the Senate as a whole and its individual Commissions, within their specific terms of reference, to contribute not sporadically and accidentally but with organic continuity, to the determination of the policy to be defined and followed, the measures to be taken, the Conventions to be promoted in order to deal successfully with the dangers forecast by science to human health and life itself as a result of the disturbance of the natural balance and the deterioration of the environment.

1. WHO DOES THE TEACHING?

The teachers were chosen not so much on the basis of their parent institutions as for their specific expertise, corresponding to expressed requirements. Selection criteria might be listed as follows:

a) University-level teachers: chemistry, botany, zoology (entomology), commercial technology.
b) Directors of research institutes closely concerned with some types of environmental problems: the Director of the Higher Institute of Health (Rome), the Director of the Water Research Institute of the National Research Council (Rome).

The six teachers and experts were made available immediately to form with six Senators the "Orientation Committee on Ecology Problems", presided over by Senator A. Fanfani. The six Senators were to obtain from the scientists the necessary information to promote a properly updated environment policy in the Senate. The texts of the scientists' lectures, together with the Senators' comments, were to be made available to the whole Senate in a publication, thus effectively extending to all Senators the benefit of the latest information.

2. INSTITUTIONAL ORGANISATION

The extraordinary character of the initiative did not call for any special organisational structures. However, the exceptional quality of the participants made some simplification necessary:

- place: Palazzo Madama,
- particularly tight timetable, with maximum time-saving,
- strict obligation on lecturers and audience.

It may be added that, as this was an activity very much "sui generis", an effort was made before and during the course to interest national public opinion by means of announcements and reports in the press. As a result all cultural and political circles were widely involved. Obviously a course of this kind, held in a political institution, was imbued with political interests destined to appear more and more clearly to all public opinion. But this element did not detract from the value of the initiative; it helped to characterise it and give it particularly important and promising significance. Many felt that it endorsed the principle of more explicit commitment of the authority of the State in environmental matters.

The President of the Senate A. Fanfani had undertaken to arouse expectation, wishing to show that this was not an improvisation but the result of a ripening of ideas which he intended to affirm as a service to his country.

An address given by A. Fanfani at San Francisco on 26th June 1970, on the 25th anniversary of the United Nations, expressed acute concern about the dangers to all mankind from the increasing imbalance of natural forces. In another address at Rome on 18th February 1971 to a group of young people he was even more explicit about the need for commitment at the level of the legislative and the executive powers.

The programme of the lectures, or rather the information meetings, included not only the papers of lecturers and experts but also active participation and conclusions by Senators. The proceedings covered 10 days from 5th March to 30th March 1971.

3. COURSE CONTENT

The six papers given by the teachers and experts dealt with the following themes:

- Man and his environment in the technological society,
- Effects of the various types of environmental pollution on health,

- Water pollution: present situation and prospects,
- Wildlife problems in the context of the Italian ecological balance,
- Plant life in the context of ecological land use planning,
- Social and economic evaluation of technology.

The President of the Senate had arranged that this information course would be followed by a political debate in the Senate on the action to be taken at national or international level to protect the environment and that it would be proposed to set up a special standing Commission with the task of identifying the deficiencies of Italian legislation on the subject.

The records of the information course and the subsequent debate on 27th and 28th May 1971 were published in three volumes under the title:

"Problemi dell'Ecologia Vol.I-III, Senato della Republica, Tip. del Senato 1971".

The Senate's Special Commission for ecological problems was composed of 27 Senators from all parties and engaged in extensive activity which is still proceeding today. The link with scientific circles is maintained, but in a more occasional form. The course has therefore had some lasting results.

4. RESEARCH BASE

This consisted of the preparatory work done by the teachers and experts with the aim of informing Senators of the most accessible and up-to-date material on the subjects of the papers. The Senators also made a special contribution, giving information on legislation in preparation in various countries. For this purpose reference was also made to the Study Office of the Senate of the Republic and the relevant Information Centre.

5. CRITERIA OF SUCCESS

The success which it was proposed to achieve is reflected in various events, some of which have already been mentioned:

- above all it was a political success sustained in particular by the eminent political personality of President Fanfani - personal success of a politician, destined to enhance the prestige of the new ideas of environment protection;
- it led to the setting up of a special Commission which is actively dealing with very important problems of environmental legislation;

- it provoked more cordial and more frequent contacts between individual scientists and Senators interested in environmental problems, in particular the Senators on the Special Commission, thus helping to establish the custom of relationships between Government authorities and scientists.

Nevertheless the success of the seminar would be greater if the official meetings between Senators and scientists were repeated periodically as a "recurrent" updating, with programmes duly adjusted to cover the most urgent information needs.

The Pro Deo International Free University of Social Studies

TRAINING COURSE ON ENVIRONMENTAL POLICY

Rome, ITALY

by

V. GIACOMINI

INTRODUCTION

The initiative of a Training Course on Environmental Policy is consistent with the character of the Pro Deo University in Rome, which is an independent international university of social studies. It consists of a Faculty of Political Science with related post-graduate schools in Sociology and Administrative Science and Technology, and a Faculty of Economic Science with related post-graduate Schools in Economics and Business Management.

The Course therefore satisfies the general requirements of this University: training of managerial staff with adequate technical preparation and social responsibilities. Like the University it is designed to provide a meeting place and a link between the academic world and working life, i.e. between university specialists and public administrations, international organisations, firms, parties, trade unions, and public opinion.

The Course is intended for many categories, but especially for present and future decision-makers - for professionals holding responsible positions in administrative bodies, in particular government departments.

1. WHO DOES THE TEACHING?

The choice of course lecturers is also governed by the desire to create links between the academic and the business worlds. Lecturers are drawn from the following fields:

i) University teachers (of Business Technology, Biological Science, Ecology, Geochemistry, Forestry, Physics, Sanitary Engineering, Town Planning, Development Planning, Programming Theory and Systems, Public Law, International Law, etc.).

ii) Directors of Research Institutes and Technologists (Director of the Institute of Industrial Medicine, the Institute of Architectural Technology, the Institute of Air Pollution, the Institute of Water Research, the Italian Institute of Hydrobiology, the Institute of Economics and Finance, the Design Engineering Office of the Ente

Nazionale Idrocarburi, Secretary-General for Programming, President of the ante Nazionale per l'Energia Elettrica, President of the National Committee for Nuclear Energy, etc.).

iii) Directors of Conservation Institutes and Agencies (Director of the Abruzzo National Park, President of Italia Nostra, President of Federnatura, Vice-President of the Italian branch of the World Wildlife Fund).

iv) Judiciary (Praetor of Rome and various jurists).

v) Industry (President of Italconsult, President of the Ente Nazionale Idrocarburi, etc.).

2. INSTITUTIONAL ORGANISATION

The organisational structure of the Course is the "Centre of Environmental Studies" set up in the Pro Deo University in 1974. The purpose of this Centre is to make available to persons studying socio-economic problems and to operators (Ministries, official agencies, industry) documentation, information and studies on economic, political and social problems of the environment. The services of the University's Data Processing Centre are also employed. The first study now in publication is a bibliography of environmental economics. But one of the most important objectives is the elaboration of a system of economic-ecological monitoring for the purpose of identifying the accumulation of residues, wastes and pollution associated with the various sectors of production and exchange of material resources and, in general, productive activities and services. Another issue studied is energy, in particular the use of nuclear energy.

This rudimentary framework forms the scientific basis of the Course, so that the necessary information, documentation and research instruments are already available in the academic context of the Pro Deo University.

The structure of the Course is becoming more organic and functional, profiting from the experience of the last two years (1972 and 1973). The 1974 Course opened at the end of February and lasts 3 months (March - May). It is held in the evening to facilitate the attendance of officials, businessmen, and students engaged in other activities during the day. Each "meeting" - the name preferred is "class" - lasts two hours and consists of a preliminary statement by the teacher on a given theme, followed by a discussion between the participants and the teacher and even among the participants themselves, who are sometimes able to contribute personal experience and documentation. Since the participants also include persons from the Third World, the issues extend over a very wide field, involving considerations of international politics.

It is a post-graduate course but a certain number of university undergraduates are also admitted free of charge. At the end of the Course participants will be interviewed and will be awarded a certificate of attendance and progress, which does not however rank as a professional qualification.

3. COURSE CONTENT

The objective of the Course is not to train professional experts, but rather to provide information and to arouse participants' awareness of environmental issues, focusing chiefly on decision-makers, and it therefore covers a wide range of disciplines. The aim is to call attention to the impossibility and irrationality of any sectorialism in environmental matters. One of the most serious defects of a country's environmental policy lies in jealously separated competencies and the consequent handling of environmental problems in tight compartments with no intercommunication or interrelations. The principal objective of the Course is to show that intervention in one sector may have repercussions in many other sectors, even remote ones.

There are therefore two main aspects of the Course:

a) familiarisation with the main elements of basic ecology in the broader sense of "global ecology": physical, biological and human environmental factors; basic concepts of ecosystem, biosphere and ecosphere; biogeochemical cycles, dynamic equilibria; natural and man-made landscapes.

b) study of the effects on the environment of the use of natural resources, with special reference to sources of energy, cost-benefit problems, and the possible alternatives open, especially to Italy.

The main items in the Course are as follows:

- Elements of general ecology - Man and environment. Energy cycle and biogeochemical cycles - Human intervention and consequent effects.
- Vegetation, Reafforestation. Human settlements and vegetation. Wildlife. Marine equilibria, Parks and nature reserves.
- Soil and soil protection.
- Population, natural resources and environment.
- The town as an artificial ecosystem - Urban congestion.
- Transport and traffic development in towns - The problem of leisure.
- Waste disposal.
- Energy and the environment.

- Air pollution: sources and effects. Pollution and the work environment.
- Water problems. Desalting of seawater and brackish waters. Hydro resources in Italy. Needs and water resources. Water pollution. Pollution of the sea.
- Elements of environmental economics. Integration of the environment objective into national and regional planning. Monitoring the state of the environment.
- The ideology of nature.
- The limits of development.

This programme clearly shows the concern with practical aspects of human interest, which receive maximum emphasis.

4. TEACHING METHODS, MEDIA AND MATERIALS

As already indicated, the Course is based on "meetings" which consist of:

i) a lecture on a specific theme covering fundamentals and providing the most relevant data; the text of this lecture is distributed beforehand as far as possible so that participants can be prepared for a useful discussion;

ii) presentation or distribution of informative documents by the teacher (charts, statistical tables, slides, films, texts, etc., and if necessary, experimental demonstrations).

iii) issue of outline bibliographies of easily accessible works, so that participants can obtain further information on their own initiative;

iv) free discussion and exchanges of information between teacher and participants; this phase of the Course may often be even more interesting than the teacher's lectures as national and regional operators give accounts of their experiences in various parts of Italy and also in other countries; there are also confrontations of ideas between representatives of various levels of culture, responsibility and authority;

v) confrontations of opinions - even political opinions - are encouraged by inviting to the same meeting two teachers who are known to hold opposite views on particular subjects; participants - especially future decision-makers - must realise the difficulties, objections, and contradictions involved in environmental issues;

vi) contacts between participants and teachers are facilitated and even encouraged inside and outside the Course to enable further information and documentation to be obtained.

In reality the Course may therefore be of longer duration and represent a heavier commitment than indicated above.

It is understandable that the instruction given should be mainly theoretical since the intention is not to train professionals or technicians, but to provide information and establish contacts among persons of very different background and outlook and above all specialising in different, even traditionally separated sectors.

It is worth reiterating that the main purpose is to facilitate "meetings", to create the habit of exchanging ideas and experience among academic and industrial circles whose co-operation is essential for a new "environmental policy".

5. RESEARCH BASE

As already indicated, a scientific research base is provided by the existing research centres at the Pro Deo University, and in particular the following:

- A Data Processing Centre for processing and disseminating information according to the most modern techniques; this Centre is available for preparing documentation on environmental matters;
- a Centre of Environmental Studies, to which attention has already been drawn above.

These structures, which service the ordinary courses of the Pro Deo University, are a sound support for continually enriching the information content of the Environmental Studies Course. They are also available to present and future decision-makers who are familiar with the new multidisciplinary method of treating environmental matters.

6. CRITERIA OF SUCCESS

Now in its third year, the Environmental Studies Course of the Pro Deo University is faced with ever clearer problems of finalisation and functionality. The approach is very promising, the content improves from year to year, but there is no lack of difficulties.

The positive aspects which have brought initial success and which should also ensure future success are as follows:

- novelty of approach: to have taken as the basis of the Course the structures of a University of Social Studies, and to have included a wide range of naturalistic elements and disciplines usually outside socio-economic interests;
- to have designed the Course as a multidisciplinary meeting, and the sessions as group discussions, thus getting rid of all academic formalism;
- to have planned the Course specially for present and future decision-makers, particularly the youngest;
- to have focused information on the more concrete practical problems of the country's human environment: energy, employment, leisure, development, conservation and production, basic natural resources, etc.;
- to have chosen not to train experts, but to introduce into various branches of State and regional administrations a new outlook and a favourable attitude to continued multidisciplinary "meetings";
- to meet the new demands of Central Government bodies (Ministries, Parliament, Senate, Political Offices) and Regional Government structures (Departments of the Environment) for persons who are not only specialists in particular sectors but who are capable of understanding the full breadth and interrelatedness of environmental issues.

Environmental Protection Agency

DECISION MAKERS ENVIRONMENTAL SEMINARS

Washington D.C., UNITED STATES

by

J. BAHNICK

INTRODUCTION*

Between 1964 and 1971 the United States Environmental Protection Agency funded, and the League of Women Voters sponsored, a series of 17 three-day seminars on the problems of water quality and related land use in major U.S. river, lake basins, and coastal areas. The primary objective of these seminars was to bring information to persons identified as "decision makers" in the community concerned. More than 1,400 people representing widely varied economic, occupational, geographic, and vocational backgrounds participated. Representatives were drawn from such diverse groups as: real estate developers, labour leaders, engineers, newspaper editors, mayors, government employees, professors, ranchers, retailers, and bankers. The central focus of these persons was their identification as "decision makers".

In the United States and indeed the world, public interest in environmental quality expanded during the seven years these workshops were held. New federal and state laws, agencies and programmes were established, organised citizen activity grew immensely, and the news media greatly expanded its coverage of the field.

As the interrelationship of all facets of environment becomes clearer, the complexity of the myriad problems becomes apparent. Residents of different states or regions are often unaware of each other's environmental problems and the mutual effects of unilateral actions. Business, civic, industrial, agricultural, conservation, and other groups are heedless of many of their current environmental problems and the lack of channels of communication to enable them to take effective action.

Thus, "Decision Makers" workshops were conducted in order to inform community leaders how to guide their own organisations in taking more effective action on environmental problems.

The basic format was a series of three-day seminars for participants drawn from diverse groups throughout the geographic area of concern. It was

---

* The author gratefully acknowledges the assistance of the Charles County Community College, notably James B. Edwards and Dr. J. N. Carsey, in the preparation of this paper.

found that approximately fifty participants was a good working number. This provided a group large enough to be representative and to form a nucleus of informed leadership for future action in the area, yet small enough to facilitate group discussion and easy social intercourse. Participants were not asked to pay their own expenses, in order that they might be chosen for potential leadership rather than ability to pay and so that they would feel obliged to participate in the follow-up activities.

All the seminars surveyed the specific water resource problems of a defined region, outlined government functions and legal framework relating to water management in the area, and presented examples and techniques of possible action by influences, both political and non-political.

It is important to note that this was not a structured university "course" but rather learning accomplished through the informal atmosphere of workshops and discussion groups. The keys to the success of the workshops were:

a) Identifying and attracting to the workshops important and influential "decision makers".
b) Presenting the material in such a manner that the participants would benefit from the experience.

1. WHO DOES THE TEACHING?

Lecturers, speakers, and discussion group leaders were all selected from the immediate geographical region. They were drawn from area educational institutions, environmental societies, industry, labour unions, and public officials. A representative of the Environmental Protection Agency (EPA) was always in attendance. It is important to note that the League of Women Voters had the responsibility for managing the conferences. Selection of both attendees and "experts" was done by committee members of the League. Frequently they depended on an eminent local conservationist, educator, or public official to assist them. Nonetheless, the workshops were as good as the work done by the League of Women Voters' Committees in properly selecting both attendees and experts and in organising the meetings themselves. Needless to say, some of the 17 conferences were more effective than others, dependent upon the skill of the organisational committees.

Typical speakers included:

Legal counsel for Senate Public Works Committee
A professor of chemistry
A wastewater treatment plant consultant

Director of the Area Council of Governments
Community College President
President, American Waterworks Federations
President, Water Pollution Control Federation
City Mayor

Members of the League of Women Voters' National Environmental Programme and Projects Committee were quite often experts in their own right and participated in the teaching process.

Who Does the Teaching? was characterised by two elements. Most were not teachers in the classic classroom sense and all were professionally active in some area of environmental concern. In addition, when the list of experts is reviewed, their diversification is evident. The success of the seminars is attributable in no small way to the broad scope of attendee with the common thread of environment uniting them.

2. INSTITUTIONAL ORGANISATION

The organisational structure was basically twofold. One was the structure of the League of Women Voters and how they went about organising the conference. The other organisational structure is the actual conference itself.

The League's technique was to select an overall chairman and then create a number of committees to get the conference work accomplished. The League then provided a checklist:

- Decide what is needed and outline project objectives
- Draw up plan of operation, with budget
- Submit proposal for a grant, or be assured of other funding
- Select geographical area to be included in project
- Check on availability of local leadership
- Initiate the formation of regional planning committees as needed under the plan of operation drawing from different groups
- Distribute responsibility, but provide for co-ordination
- Provide regional planning committees with guidelines, money and help adequate to ensure success without stilling initiative.

One of the most important of the general chairman's first tasks was the selection of a planning committee. This committee included people from a broad range of occupations drawn primarily from the geographic area of the seminar. Experience in the United States has indicated that a committee of 15 to 20 members is about the right size; too large a group is unwieldy, too small lacks variety of viewpoints.

The first meeting of the planning committee established the project objectives, the nature and dimensions of the problems to be dealt with. Lecture topics were discussed and the names of good speakers proposed. Committee members suggested organisations and individuals who were asked to nominate participants. Location and date of the seminar is established, sub-committee assignments made, the budget outlined. Lines of communication are worked out and a work schedule agreed upon.

At the second meeting, three or four months later, the committee selected workshop participants from the list of nominees, reviewed the programme, discussed follow-up procedures, planned publicity and settled details such as kit materials and recording of conference.

The planning committee established the following sub-committees and selected their chairman:

Recruitment Committee
Programme Committee
Follow-up Committee
Arrangements Committee
Kits Committee
Publicity Committee
Finance Committee

The following factors were used to select attendees:

a) Is the nominee a leader of the organisation?
b) Does he have the connections necessary for effective follow-up?
c) Is he already interested in the field?
d) Will his organisation co-operate?
e) If he is an expert, should he be considered as a speaker or panel member?

Each committee was provided a checklist to insure that a certain minimum effort was required by each. The conference itself was a three day affair composed of speakers addressing the entire group, panel discussions attended by all and a unique "action plan" session.

A typical conference started about noonday with registration. That evening a banquet with a major speech by one of the highly placed experts key noting the theme and direction of the conference. The reception and banquet provided excellent opportunities for informal discussions and introductions that were often followed up. Day 1 would start early with various discussion groups and conclude with a lengthly working type dinner. Day 2 might normally be a half day session with attendees broken up into as many as five

sub-groups each led by an expert. The entire conference might re-form for another short address prior to adjournment. Day 3 was usually a major panel session lasting all morning. A summary or wrap-up was then conducted by the League of Women Voters' staff.

A follow-up programme was outlined by the League and questionnaires were sent to all attendees about 2 months after the conference. The follow-up was designed to convince conference attendees that someone was interested in their progress, and that the conference provided meaningful goals and courses of action. In a word, the League expected follow-up action from the attendees and then let attendees know that they were watching this follow-up action and its progress.

3. COURSE CONTENT

The Program Committee planned the workshop programme and invited the speakers and panel leaders. The Program Committee was usually composed of its chairman, plus the General Chairman, Follow-up Chairman, Public Relations and Kit Chairmen, plus several experts from the Planning Committee.

> "The purpose of the three day workshop was not to make expert environmentalists of the participants. The goal was to give them a better understanding of the scale of the problem; the interrelationship of environmental, social, and economic factors; to show them how they can participate more effectively in the field; and to put them in touch with people of like interests."

These environmental workshops were built around three basic elements: information about land and water in the area, about government and legal institutional arrangements, and about techniques for more effective citizen action. The broad composition of these three elements was:

Land and Water in the Region

- Water as a natural phenomenon and as a resource
- Current or planned projects in the region
- Land and Water law
- Effects of economic development

Institutional Arrangements

- Relevant local, state, and federal programmes
- Legal framework
- Regional arrangements

. Current problems
. Planning for the future

Techniques for Citizen Action

. Case histories of citizen action
. Problem solving in small groups
. Tools and techniques for citizen action

The course content was aided and abetted by providing major headings which could then be modified to fit the circumstance of the area holding the conference.

Major Topics:

Water Supply
Septic Tanks, Sewers, Treatment
Industrial Pollution and the Economy
Metropolitan Blight and Sprawl
Open Space and Farmlands
Flooding
Super Highway Inter-Change Location

These major topics were refined for the local community and often became topics for group discussion at one of the conferences. Actual seminar titles as outlined below indicate the degree of refinement.

Pertinent Water Pollution Control Acts
Why Wastewater Treatment?
Who Pays?
How Do You Distribute the Costs?
Operator Training and Certification
Who Can Provide Assistance?

The last title, for example, was an actual panel discussion topic and outlined where community leaders could get assistance to help attack their environmental problems.

4. TEACHING METHODS, MEDIA AND MATERIALS

Generally speaking three teaching methods were utilised: lectures, followed by open discussion periods; problem-solving groups; and a follow-up programme.

In selecting speakers, the League looked for people who were experts in their field and who dealt with the problem first hand, rather than recruiting

merely big names. They selected speakers with a broad range of backgrounds as well as from different areas. Typically, the following types of speakers were selected:

- A keynoter, used to establish the overall nature of the local or regional problem.
- An expert, who focused on one particular facet of the problem.
- A lawyer knowledgeable in environmental matters, who discussed those provisions of applicable laws that citizens can use to accomplish their objectives.
- A speaker who discussed what other states or groups or past seminars have done.

Lively discussion by participants were encouraged and ample time following each speech was allotted for this purpose.

A major segment of time was usually allotted to problem-solving sessions. For these, the participants were divided into groups of ten, with a knowledgeable and experienced discussion leader in charge of each group. The programme committee drafted the group problems well in advance of the seminar. It was found to be unwise to draft problems that are identical to well-known, controversial issues. Several approaches were used, each group can be assigned a different problem or all can be assigned the same problem. Following the problem-solving session an appointed spokesman (not the group leader) made a short oral report to the entire seminar.

In order to derive the maximum benefit from the seminars, the programme was structured from the outset to facilitate follow-up activities. The follow-up chairman was in on all planning sessions and an adequate budget for follow-up activities was apportioned.

To facilitate follow-up activity, the programme included such topics as:-

How to gather facts, form committees, work with officialdom, use the media, and get to the public.
How to create and work with a coalition of organisations.
How to get official or quasi-official recognition.
How to lobby effectively.
How to use the courts as individuals or in class action suits.

It was the duty of the follow-up chairman to keep in touch with the participants and encourage or prod them to carry out follow-up activities.

In general, the teaching method was a workshop-like environment utilising expert speakers and panel members. What was somewhat unique was the extent of follow-up. The characteristic takes the conferences out of the "one-time,

one-topic" category of seminars/conferences that do not place much emphasis on follow-up.

5. RESEARCH BASE

By and large this category does not apply to this topic but in reality each conference/seminar sponsored provided a base of knowledge for the next. Thus, the seventeenth conference undoubtedly owed much of its base to the preceding sixteen conferences.

6. CRITERIA OF SUCCESS

It is, of course, very difficult to establish accurate and positive measurements of success; however, over a period of time the answers to questions such as the following will have provided strong indications:

- Have officials who attended begun to work more closely with co-operating agencies?
- Have new bond issues relating to environmental control been successfully introducted and passed?
- Have better qualified people been hired to carry out environmental programmes?
- Have persons working in environmental control received pay increases?
- Has there been greater community involvement in current environmental problems?
- Has there been an increase in information on regional environmental problems?

Right now in the United States the answers to all of the above is a resounding YES. Would it still be so if there had not been conferences is far more difficult to assess. What is important is that specific problems were attacked by people with the wherewithal to solve them and in many cases did exactly that. When discussing decision makers, the criteria for success ought to be: Did they make any decisions? That is reasonably easy to determine. What is more difficult to determine is: Did they make the right decision? Also difficult to determine is whether there were other, more critical, decision makers who were not reached.

The League outlined what they considered various productive courses of action. These also make additional criteria for success.

Courses of Action (criteria for success):

Build public awareness
Encourage discussion or resolve conflict
Support (or oppose) specific proposals
Continue to support existing programmes, appropriation, enforcement, etc.
Prod officials to attack problems
Encourage an official study or planning project
Support steps in implementing such a study or plan.

Each conference did one or more of the above. Many did considerably more than that. If these were goals we must acknowledge that they were achieved. It is only the degree of success that is difficult to determine.

Indiana University

ENVIRONMENTAL STUDIES PROGRAMMES

Bloomington, Indiana, UNITED STATES

by

C.E. NELSON, Director

HISTORICAL RESUME

The need for an interdisciplinary programme at Indiana University dealing with the influences of science and technology on society with special emphasis on the environment was suggested by individual faculty members as early as 1963. A proposal for an interdisciplinary environmental studies programme was initiated in 1965 by Professors from three departments (Microbiology, Political Science and Physics). However, it was not until the summer of 1970 that support for such a programme reached a "point of critical mass". The factors which changed University receptivity between 1965 and 1970 included the discovery of environment by large numbers of students (especially in 1969) and an attitudinal change in natural sciences from scepticism of the need and feasibility of an interdisciplinary approach to concern that scientific knowledge be applied to the emerging environmental issues. This intervening period also saw the development of some courses in environmental aspects of traditional departments (e.g. Environmental Policy, Environmental Biology) and of an experimental interdisciplinary course (Environment and Man).

At an ad hoc meeting of the natural sciences faculty in July 1970 there was unanimous agreement on the desirability of such a programme, but questions of programme status and curriculum remained unanswered. Specific proposals were invited for the next meeting which was held in September. Programmes at other universities and existing courses at Indiana University were discussed and a curriculum sub-committee was appointed. A programme submitted by the sub-committee was approved with some modifications by the ad hoc committee in November 1970, and was subsequently presented to and approved by the University administration. An Environmental Studies Programme was established in May of 1971. An undergraduate major in Environmental Studies was first offered by the College of Arts and Sciences in the Fall of 1971.

The University concurrently decided to seek state approval for the establishment of a School of Public and Environmental Affairs (SPEA). The School was given final approval early in 1972. A number of existing programmes were transferred to the new school. These included the Environmental Studies

Program, the Urban Affairs Program, the Aerospace Applications Research Center and the Program on Science, Technology, and Public Policy. An Undergraduate Concentration in Environmental Policy for students pursuing a Bachelor of Public Affairs in SPEA was initiated in the Fall of 1972. A Graduate Concentration in Environmental Policy for students seeking a Master of Public Affairs degree (SPEA), a Graduate Minor in Environmental Studies (for students seeking the Ph.D. in other areas) and a Certificate in Environmental Studies (available to undergraduate students in any division of I.U.) will be offered in the Fall of 1973.

Proposals which are presently being considered include a Teaching Major and Minor, teacher certification in Environmental Studies, Master of Arts in Teaching in Environmental Studies, and Master of Science in Environmental Sciences.

In terms of strategies for developing programmes elsewhere, our experience can be summarised as repetition of suggestions which were only accepted after major attitudinal changes elsewhere in the system.

PRESENT PROGRAMMES

The undergraduate programmes are designed to introduce students to selected aspects of current thinking on the nature, causes, and solutions of environmental problems. They combine relevant fundamentals from natural and social science with an interdisciplinary synthesis. The interdisciplinary synthesis is provided both by optional introductory courses and by required senior seminars. Broad disciplinary background is provided by a series of introductory and intermediate courses taught by traditional departments but especially designed for environmental emphasis (e.g. Physics and the Environment, Urban and Environmental Geology, Environmental Biology, Environmental Economics, Environmental Policy [Political Science], the Law and the Environment [Business Law]). Disciplinary depth is provided both by advanced level requirements and by cognate requirements. The three present undergraduate programmes differ markedly in the degree of specialisation. A Certificate in Environmental Studies provides an introductory survey and is available to students enrolled in any division of the University. The Certificate requires 8 courses (23-24 semester hours). A Major in Environmental Studies is available only to undergraduate students in the College of Arts and Sciences. The major requires 14-15 courses (about 45 semester hours) and specifies that the student must also complete another major of his choice. The intent of the requirement for a second major is to assure depth in a particular field. A Concentration in Environmental Studies is available only to undergraduate students in the School of Public and Environmental Affairs (SPEA). The concentration consists of 8 courses; 8 or 9 additional environmentally related courses are required of all students seeking a Bachelor of Public Affairs (SPEA).

Two graduate programmes are now offered. A Graduate Minor in Environmental Studies is available to students seeking a Ph.D. in other fields, subject to the approval of their committee. The minor requires at least 12 semester hours of graduate level credit from at least two disciplines outside the student's area of specialisation. The Environmental Policy Concentration for a Master of Public Affairs requires four courses: Environmental Systems Dynamics; Political, Economic, and Regulatory Aspects of Environmental Control; Applied Ecology and one elective (12 semester hours total).

1. WHO DOES THE TEACHING?

Our programmes consist of two types of courses - interdisciplinary courses taught by programme faculty and courses in standard academic departments taught by the regular faculty of those departments. Nearly all of the departmental courses have been developed within the last few years in response to student demand and to the needs of this programme. Most are taught by individuals having disciplinary rather than professional expertise, notable exceptions are "The Law and the Environment" and "Urban and Regional Planning". The disciplines involved include ecology, physics, geology, geography, economics, political science, and sociology. These courses were largely developed as a result of the desires of particular faculty members to offer courses with an environmental focus. The selection has thus been largely self selection and has invariably reflected high levels of motivation and commitment and either long standing expertise in environmentally related areas or a desire to begin specialisation in such areas. The only selection with respect to attitudes towards subject and towards students has been the necessary desire to voluntarily develop a new course at the appropriate level. The diversity of attitudes regarding the seriousness and optimal solutions to various environmental problems has effectively introduced the students to the complexity of environmental issues and the constraints of disciplinary viewpoints. (In reviewing other programmes, it sometimes appears that realism and perspective may have been lost by too careful selection of only "environmental activists" for staffing programmes.) A main criterion in recruiting faculty for the Environmental Studies Programs has been the acquisition of professional perspectives not otherwise available, especially of those kinds which cut directly across standard academic disciplines: regional planning, engineering, environmental impact statement preparation, government work in environmental areas, and the impact of science and technology on government and society. In our recruiting of programme faculty specialisation in particular areas (including ability for field work etc. where relevant) has been primary as has been evidence of general ability. Motivation and level of commitment have been inferred from achievements. Teaching ability is very difficult to evaluate prior to observing classroom performance (except that individuals who cannot give a clear and interesting seminar are normally not considered further). A balancing between knowledge and teaching ability occurs over the long term in that teachers who are ineffective at lower level teaching but good with advanced courses and seminars are encouraged to devote more of their effort to advanced courses and vice versa. Faculty who are ineffective at both levels are discharged or encouraged to seek other positions.

Non-university based professionals are routinely brought in for seminars and class sessions. Particular emphasis has been on local, state, and national officials and non-academic research institutions (e.g. Resources for the Future, etc.). Their presentations are commonly invited on topics of current general interest which have been considered in class (e.g. effluent changes) or on topics which complement academic subjects (e.g. emphases next year in environmental control at the state level). Such visitors are routinely asked for their perceptions of training needs and their evaluation of current and proposed courses and programmes.

Looking to the future, our programme still needs further development of both professional and practical expertise. The latter is very important since, for example, governmental environmental quality programmes require a fusion of disciplinary and professional perspectives provided neither by the traditional disciplines nor by traditional professional programmes. This kind of perspective can only be integrated into a programme by hiring individuals with substantial experience in such positions. At the same time, such practical experience seems the best guide to the kind of training requisite for producing the new kinds of professionals which improved environmental quality will require.

2. INSTITUTIONAL ORGANISATION

The Environmental Studies Programs are administered by the Director of Environmental Studies in accord with policies established by the Environmental Studies Executive Committee. The Director and Executive Committee are appointed by mutual agreement between the Dean of the School of Public and Environmental Affairs (SPEA) and the Dean of the College of Arts and Sciences (COAS). The Executive Committee is intentionally interdisciplinary and presently consists of the Director, two SPEA faculty, one law school faculty and a member of each of the following COAS departments: biology, zoology, geography, geology, physics, economics, and political science. All members are involved in environmental teaching and research. Most actions of the Executive Committee are taken after circulation of proposals to an Environmental Studies Advisory Committee. The Advisory Committee has 25 members representing SPEA, COAS, the School of Business, the School of Law and the School of Education. Its purpose is to assure that input is received from all interested groups on the faculty by providing an avenue for suggestions and discussion while programmes and policies are still in the formative stage. Programmes proposed by the Executive Committee must be approved by the appropriate school faculty and administration (COAS, SPEA, or Graduate School, depending on the nature

of the programme). The budget for the programmes is administered by the Director subject to the approval of the Dean of SPEA.

The question of the desirable or ideal organisational base for managing an environmental studies programme is difficult to answer in the abstract. Presumably, if funds are readily available, the ideal is a new organisation (institute or centre) large enough to offer the entire academic programme for all of the various kinds of training contemplated and large enough to support the other services necessary. Since this requires not only numerous faculty and massive amounts of space but also libraries, major computer facilities, provision for student services, etc., it is only relevant when a commitment to establish the equivalent of a new university is at hand. When an environmental studies programme is to be established within an existing university, the question becomes less what is the abstract ideal and more a setting of priorities in terms of the functions which must be funded to make the new programme effective (and at what it should be effective). In this regard an interdisciplinary programme with the power to offer courses and degrees and to recruit faculty to fill critical gaps has some distinct advantages. As an interdisciplinary effort, good communication is maintained with existing programmes, petty jealousies are minimised, and maximum use is made of existing resources. This is especially advantageous in the case of prominent environmental specialists who are already associated with existing programmes. This of course assumes reasonable co-operation between existing programmes. In our case this has certainly been true. The programme has developed at a satisfactory rate in circumstances where resources for an independent programme were clearly not forthcoming.

Our strategy of an interdisciplinary programme was predicated on the maximal use of the teaching facilities of existing departments. Our initial research strategy has been based on the stimulation and co-ordination of co-operative projects between faculty in other departments. As faculty specific to the programme have increased, some projects based largely on our own resources have been initiated. The main institutional constraints on the development of the programme have been in the requirements for course and programme approval (to which all academic programmes are subject) and in competition for funds for expansion. Like all other budgets, ours is determined by proposals by the programme staff which are then balanced by the Dean (originally College of Arts and Sciences, now School of Public and Environmental Affairs) against the needs of other programmes. The criteria utilised include demonstrated student demand and plans for University development. In establishing the programme little use was made of outside advice. A board of visitors and institutional memberships in professional organisations are now being established. The control for salary, promotions and tenure for

faculty specific to the programme rests with the programme; similar control for faculty teaching environmentally related courses in other departments rests with those departments (performance in environmental courses is, however, part of the evaluation).

The Environmental Studies Program, as an integral part of a state university, does not generally as a programme form official ties with organisations in the community at large. Members of the Executive Committee however serve on the Bloomington City Environmental Commission and various of its sub-committees, as faculty adviser to the Indiana Public Interest Research Group (InPIRG) (a multi-school student group), on the executive committee of the local Audobon Society, and provide expertise for various university and non-university programmes including executive training sessions (Business School), Summer Science Institutes (Education), the League of Women Voters, etc. Until its incorporation into InPIRG, a student organisation known as Crisis Biology was partially funded by the Environmental Studies Program. A closer tie is provided by splitting a position between a faculty position in the School of Public and Environmental Affairs and a position as the Bloomington City Planner. Other functions which might otherwise have to be developed are provided by training institutes for public officials (sponsored by SPEA), for businesses (sponsored by Business) and for adults in general (provided through Continuing Education) and school teachers (provided by Education). Were these programmes not available then an Environmental Studies Program might choose to develop them. (As in all human affairs, some attention must be given to the development of a permanent base before extra programmes are elaborated; in our case the initial effort has intentionally been primarily the development of academic programmes).

Routine arrangements for exchange of graduate students among other mid-western universities is provided by the Committee for Inter-institutional Co-operation (which has an Environmental Studies panel). Other exchange programmes are arranged on a case-by-case basis (several international student-faculty exchange programmes between Indiana University and foreign universities are currently working well).

Student advising is handled primarily by the faculty of Environmental Studies Program: in cases where a programme is part of a double major or is a graduate minor concentration, two advisers are typically provided for each student. Students are required to see an adviser before registering each semester.

3. COURSE CONTENT

The content of the programme focuses on the natural and social elements which interact in local and global systems to produce a given level of environmental quality. The criteria for determining the particular courses which were required for each programme were not explicitly delineated but were implicit in the relative importance assigned to each topic in terms of understanding and controlling the total system. The consensus was that these were

a) systems and their behaviour,
b) applied ecology taken in a sense broad enough to include various physical and chemical constraints and
c) the economic and political aspects of decision making and regulation.

These are most concisely treated in the graduate Environmental Policy Concentration, where each of these three areas is explicitly covered by a required course. The requirements for the undergraduate Environmental Studies Certificate also reflect this ordering (systems being covered by introductory courses and again by senior seminar). The second most important groupings were felt to be

a) statistics and/or computer language,
b) basic physical science,
c) management skills and/or other applied social science.

These elements (in addition to the preceding group) are required in the Environmental Studies Major and the undergraduate Environmental Policy Concentration. The conceptual bases for the integrative courses include emphasis on integrative systems both in the introduction and in the final third of the courses. The intervening material is presented first with a disciplinary focus (e.g. fundamentals of ecology, economics, etc.) to introduce concepts and vocabulary and then on a problem focus basis (e.g. energy, water quality) to further demonstrate the principles and their interactions. Both the problem and system focuses are explicitly used to demonstrate the necessary integration of natural with social sciences in understanding and managing environmental systems. In picking cases care is used to illustrate local, regional, and global problems. The global perspective receives especial attention in the integrative systems parts of the courses. Courses between the introductory and advanced levels are taught by disciplinary specialists and are largely organised according to concepts of the discipline. Special effort is made to provide students with field work and laboratories in natural science courses as well as in a course in environmental measurement.

4. TEACHING METHODS, MEDIA AND MATERIALS

Our interdisciplinary introductory course has evolved from one where 25 faculty or guests each presented one or two lectures to a present programme of a single key faculty member who gives most of the course but invites 6 or 8 outstanding faculty to give guest lectures. The problem with too many faculty is that students are continually presented with new idiosyncracies which inhibit learning and that too much time is spent at very general levels and too little in integration. An undergraduate seminar which five faculty attended regularly was an overwhelming success both in terms of educating the students and educating the faculty; it was also expensive in terms of faculty time. It seems that multiple faculty courses are most successful when most of the faculty participate throughout the course. We are now developing a somewhat similar approach to our integrative graduate curriculum: the courses "Environmental Systems Dynamics" and "Political, Economic and Regulatory Aspects of Environmental Management" will be taught as one combined course with three faculty with divergent backgrounds sharing them as a part of their assigned teaching duties. We hope that this approach will overcome the obvious inability of any one faculty member to adequately treat all of the divergent aspects of environmental knowledge at the graduate level. Some innovation involving the assignment of more than one faculty member to each course may well be required for the synthetic aspects of graduate environmental programmes. Non-classroom learning experiences are provided in several ways: several of the science courses have required or optional laboratories, many of the "lecture" courses require an extensive research project as part of the work - students working on these projects are encouraged to work with the Bloomington City Environmental Commission or Utilities Department or with groups in their home town in selecting and developing case studies and projects, more extensive case studies and other projects are undertaken by seminar groups and by individual students who enrol for research, and a series of internships with selected governmental and business groups has been developed. Advanced courses and individual projects frequently require use of and access to computers; computer time for student use is provided free by the university. We have done some experimental work with role-playing games but have not adopted these as part of our regular programmes yet, partly because they are instructor time intensive and appear to achieve less than projects (which are also instructor time intensive). Most students have responded quite well to all of the non-classroom methods we have tried. Evaluations of these through verbal or written reports from the students and discussion with the other persons associated with the projects suggest that the students work harder and learn

more on these assignments than on more standard academic work. Films are occasionally used; these are usually previewed by faculty with the assistance of any students who happen to be available when the film arrives for previewing. They are reassessed after class use on the basis of student response and, sometimes, on the basis of student performance on exams. Audio-tapes have been spectacularly unsuccessful in holding class attention (both video tapes and audio tapes have proven effective in audio-tutorial laboratories in basic biology but have not been tried in environmental laboratories because the number of students does not yet exceed faculty availability and because the technology is so expensive that hundreds of students are required).

5. RESEARCH BASE

Research is a rubric which encompasses a large number of different processes. Undergraduate student research serves mainly to increase the depth and realism of the students education. However, a number of important secondary functions have been served by undergraduate research in connection with the Environmental Studies Programs; thus, both field studies and literature surveys have been done on questions relevant to the activities of Bloomington City Environmental Commission, to planning agencies, to university operations (recycling, power plant pollution control), and to faculty research projects, and student projects have often stimulated the inclusion of new topics in course outlines and occasionally have stimulated graduate student or faculty research projects. Graduate student research fulfils the same functions as undergraduate research and in addition generally includes significant basic or applied research. Due to the development of our programme as a co-operative effort of a number of existing departments, the thrust of environmental research on this campus has been basic research programmes conducted within the traditional efforts; research efforts stimulated specifically by the Environmental Studies Programs have been designed to stimulate interdisciplinary projects which combine basic research with relevancy to particular needs of the surrounding area - for example, one project examines the factors controlling water quality in a large multi-purpose reservoir which serves as the main water supply for the city of Bloomington and for the University.

The more significant impacts of research on University priorities are reflected in the establishment of a paper-recycling programme and of a programme to reduce pollution from the power plant. Much of the community-oriented research has focused on environmental planning, regulation or

operations (e.g. recycling) intended to ameliorate developing environmental problems and nuisances before they reach crisis proportions. Thus far, the feedback from teaching extra-university groups has largely been on knowledge-survey types of research rather than on field research (great benefits from extra-university teaching have accrued in stereotype demolition and acquisition of broader perspectives on both sides). Since nearly all significant research requires outside funding, it is evident that governmental science policy has great impact on the kinds of research done by universities - as funds are restricted in one area, and made available in another, the research proposals submitted by the university shift to conform to the availability of funds: in our case a number of individual workers have shifted direction in response to changing science policy, and interdisciplinary, applied and educational projects are usually developed only after a possible source of funding is located.

(In addition to the standard disciplinary kinds of research, three additional research programmes at IU Bloomington are relevant to this topic: the Water Resources Research Institute conducts basic research, the Aerospace Research Applications Center uses computer based information searches to provide summaries of both environmental and other technical information to government and businesses; and the Indiana State Geological Survey conducts basic and applied research related to mineral resources. All three of these programmes were established and continue in response to specific governmental policy and funding.)

6. CRITERIA OF SUCCESS

As the Environmental Studies Programs have only been operational for one or two years at the most, many of the standard criteria of success cannot yet be applied. Student enrolment in the interdisciplinary introductory courses has been near or at capacity each semester; enrolment has also been heavy in many of the introductory and intermediate level environmental courses taught by separate departments. The Environmental Studies Major is a double major and after two years stands very high in the list of double majors. The proportion of students graduating from our programmes cannot yet be assessed (but it will be high because attrition during the first and part of the second year occurs prior to declaring a choice of major or concentration). In recruiting interdisciplinary faculty, our success has been 100 per cent acceptance of offers (although one highly desirable candidate chose to decline an interview in order to accept a position elsewhere). Student satisfaction as measured by course evaluation forms and responses during counselling is higher than in

standard disciplines. No indication of employment success is yet available; a SPEA internship programme successfully placed all of our graduate students who applied, into summer jobs. Although the goals of the programme have not explicitly included the changing of local events, clear impact has been evident in the decisions of the Bloomington City Environmental Commission and Planning Commissions, in the institution of paper-recycling programmes by both the university and city, etc. These impacts on local operations imply a high level of credibility at least within the university and local community. The commitment by the University to the development of Environmental Studies Programs is evident in the increasing allocations of funds in the face of extremely tight budgets. Our initial efforts to attract major outside funding are now pending. No measure of cost-effectiveness has been made (such measures may not be the most appropriate criteria during the initial developmental phases of a programme).

7. RECURRENT EDUCATION

The Environmental Studies Programs have not yet devoted much attention to recurrent education. The School of Public and Environmental Affairs (SPEA) is devoting considerable effort to training programmes for governmental officials - thus far these have largely concentrated on budgeting but expansion into environmental areas is projected for the near future. The Program on Science, Technology and Public Policy (SPEA) includes a mid-career, academic training programme for middle level federal administrators. The Bureau of Public Discussion (SPEA) has developed adult education programmes on environmental topics. The School of Business, Labour Relations Institute, and School of Education have recurrent education programmes, several of which have included major contributions on environmental topics by faculty associated with the Environmental Studies Programs. The most immediate direct involvement of the Environmental Studies Programs in recurrent education may come from the proposed Master of Arts in Teaching.

NATIONAL AND INTERNATIONAL ACTIVITIES

Appreciable input into the formulation of environmental policy at national and international levels is provided through service of members of the Environmental Studies Executive Committees on advisory boards,

councils, and committees of the National Academy of Sciences, the National Aeronautics and Space Administration, the Core of Engineers, the Department of State, the National Science Foundation, the National Oceanic and Atmosphere Administration, the International Union for Conservation of Nature and Natural Resources, the Institute of Ecology, and various professional associations. Especially noteworthy in this regard are the contributions of Professor Lynton K. Caldwell to the drafting of the National Environmental Policy Act of 1969 (which initiated the requirement of Environmental Impact Statements).

TARGET GROUPS

The preceding sections review the Environmental Studies Programs according to education processes. A recapitulation by target groups is now in order. The Environmental Studies Certificate at the undergraduate level and Environmental Studies Minor at the graduate level are designed to increase the ability of specialists in a wide variety of disciplines and professions to view environmental issues at a generalist level. Specialists and professionals in traditional areas who will work in environmental areas continue to be produced by disciplinary and professional programmes. The aim of the Environmental Studies Major is to produce environmental generalists with collateral specialisation. The aim of the undergraduate Environmental Studies Concentration and of the proposed Master of Science in Environmental Sciences is to produce a new kind of professional who combines a knowledge of governmental functioning (budget, personnel, policy) with a knowledge of environmental issues and the resources for their solutions and who can apply these at policy and technical levels of government. Higher level decision makers are presently being reached largely through workshops and internship programmes. Major impact on students training for the education profession has been achieved through both interdisciplinary and disciplinary courses. The development of more intensive programmes for teacher training in environmental areas is anticipated for the near future. Impact on the general public has been largely through faculty participation in governmental and pressure groups and in a variety of adult education programmes.

The Florida State University

THE FLORIDA RESOURCES ANALYSIS CENTER PROGRAMME

Tallahassee, Florida, UNITED STATES

by

E. A. FERNALD, Associate Professor

INTRODUCTION

Co-operation between selected governmental units of the State of Florida and the Florida Resources Analysis Center of the Geography Department of Florida State University has resulted in special benefits for the citizens of the State of Florida. The cumulative dividend has been a rational approach to the development, protection and use of Florida's resources to enhance environmental quality and citizen well-being. Environmental quality and resource use pose high priority problems facing society today. Benefits would accrue to the various State agencies, the Cabinet, the Governor's Office, and the legislature, specifically through:

- Creation of a resources research programme
- An increase in the number of qualified State employees
- Identification of resource scholars within the State University system
- Dissemination of scientific information concerning resources and resource problems

Florida State University would benefit through:

- Financing of the Florida Resources Analysis Center
- Gain of highly qualified resource scientists
- Closer co-operation of the various segments of the University community
- Increase in high quality graduate students
- Leadership in resource use research and education
- Accumulation of data
- Released time for research

To accomplish these results, which obviously overlap, the Florida Resources Analysis Center has been funded for the attraction of three highly qualified resource management scholars plus one research associate who assists the director and is a specialist in remote sensing and cartography. All research is administered through the Resources Center Advisory Board, made up of representatives from both Florida State University and the State government, and

the Center Research Committee. The Center has helped state government to better foresee and solve complex resource problems and the scholars have gained both basic and applied research time.

A common manpower problem in state agencies has been the scarcity of employees who have a spatial view of, and an ecological approach to, resources and resource problems. In the past an agency hired a person, spent time to train him, and then, often as not, lost him to a better paying job. The following plan is helping to solve that problem and also provide better qualified men for city and county government as well.

Students accepting graduate assistantships are encouraged to serve in local, county or state government in Florida for at least one year. This period of employment would allow sufficient time for the able person to advance in his position to a point where he would be able to see what benefits he could gain through governmental employment.

The academic programme covers six quarters of work in the advanced physical and cultural course work and research skills of the geographer, courses in ecology, urban and regional planning, conservation, land and resource use, land economics, resource use law and Florida government. Special interest areas for further study in soils, biology, geology, or oceanography and the social sciences are available to students whose concerns and abilities are so directed. Field work supplements and provides a practical setting for the theoretical part of the programme. The culminating phase is the thesis research which is usually developed around practical problems. The research problem is set up with the agreement of a governmental agency and the Resources Analysis Center. The thesis quarter is spent in an internship programme within the agency for which the research is being done and for which the student might later work full-time.

An important aspect of this programme is that the students would be assistants to research being done in the Center. Seminars involve many professors, governmental leaders and invited resource or environmental specialists. Ideally, the programme also gains the participation of private enterprise in Florida. This aspect of the programme has not been developed as yet. This programme does not duplicate any existing State programme.

Full implementation of this programme requires a base budget of $124,000 per year. This investment in resource management in Florida has saved the State tens of thousands of dollars. It has also provided data for making rational resource use and environmental quality decisions. Much confusion and bad publicity have been avoided by the anticipation of problems which have allowed objective research in the disputed area.

A general budget breakdown is:

Research Specialist	$ 20,000
Research Specialist	20,000
Research Specialist	20,000
Research Associate	10,500
Eleven Fellowships at $3,000	33,000
Secretary	6,500
Consultants	500
Capital Outlay	2,000
Office, travel, and research expenses	11,500
	$124,000 per year

1. WHO DOES THE TEACHING?

Although most of a student's course work is taken within the discipline to which he has committed himself, the Center educational programme does take advantage of teachers in related disciplines who have been successful researchers and who can convey this research and its results to the students. Professors are chosen who can use, successfully, case studies in communicating the theories that they teach. Faculty are chosen largely in terms of the courses they teach. However, within this criteria it is important that the faculty member have a high level of motivation and commitment to a type of instruction which will not only develop the student in the theoretical way but also will provide him with practical applications which can be of use in governmental work. A special effort is made to introduce students who are in one discipline to the thinking of professors in another discipline. For example, a student who is majoring in geology is required to take several courses from the disciplines of planning, geography, and biology. In addition, all students are provided with the opportunity to take a course in environmental and resource use law. At Florida State University all of these courses are taught by professors who have worked together on Florida's environmental problems and who have individually or co-operatively engaged in state or regional environmental research. No specific criteria are set to be met by the professor in relation to his knowledge or teaching ability. However, no complaints have been voiced in regard to the teaching ability of the professors in the programme.

Non-university professionals are very often brought into the programme. These contributions are generally on an informal basis by a professor asking a state agency head to be a visiting speaker in his class, or through the use of a consultant specialist either in a class or in a seminar. Other

contributions of non-university professionals are seen as they participate in research projects. Their input to the project often is instructional in nature. The relation of their contributions to those of regular faculty is minimal though important. They do have some input in developing curricula and courses, as the Center Director invites them to suggest topics that should be covered in courses, skills the students should have, and as they contribute in a seminar situation. It is felt that teachers in this programme need the same teaching abilities as teachers in other courses; however, it is felt that a professor should be one who has a strong background in research and associated field work skills.

2. INSTITUTIONAL ORGANISATION

Administratively, an all-university Center should be under the supervision of the Graduate Dean and Director of Research. Space for the Center will be provided by the Geography Department. The structure of the Center includes a director, a full-time secretary, an equivalence of three full-time research specialists, a research associate and approximately eleven graduate assistants. Only the director, secretary, and research associate will be assigned physically to the Center. The researchers will be free to engage in research using their own department as base. The rationale of the Center is to increase communications between state agencies that have research needs and the research resources of the university. The Center's function is to encourage and support primarily state-oriented research projects and to provide a mechanism for multidisciplinary co-operation when it is advisable. Future concerns of the Center will include projects funded by the federal government and national private funding agencies. In no way is independent resource research discouraged.

For the purpose of establishing priorities among state agency requests a State Agency Priorities Committee will be set up. This committee will consist of one representative each from the Departments of Administration and, natural Resources, the Trustees of the Internal Improvement Trust Fund, the Coastal Co-ordinating Council, and the Governor's Office. This committee will meet only on those occasions when the agencies' requests for research are more numerous than the Center can handle.

The structure of the Center is loose for two specific reasons. One reason is to provide as little interference to the researcher as possible. The other is to allow the Center the flexibility it may need to meet the changing needs and opportunities of resource oriented research and education.

3. COURSE CONTENT

As suggested earlier in this report the content programme for a student is determined primarily by the department where he has established his major, such as biology, geography, geology, or other disciplinary fields. However, within the resources analysis programme the students are encouraged to take techniques courses such as cartography, aerial photography interpretation, computer mapping, and quantitative methods. Regardless of major, each student is required to take a basic ecology course and a course in resource use law. Just as the administrative organisation of the Center is purposefully flexible, it is important that course content requirements are also flexible. The required courses outside of the student's departmental major depend upon the interest and background of the individual and his future objectives. In this particular programme there is a heavy emphasis on integration of natural and social sciences. While the local/regional illustrations and research are the dominant topics of most research, courses make international comparisons and study global perspectives. It is a strongly held belief that resources and environmental problems are all world-wide in their impact.

4. TEACHING METHODS, MEDIA AND MATERIALS

Several teaching methods, while not necessarily unique, are heavily utilised in the teaching aspect of the Center programme. First, there is a heavy emphasis on field work. Field work is undertaken at various scales from a simple class project to the undertaking of a state-generated research project. Several statewide projects have been successfully undertaken as class projects. In one or two cases different classes have co-operated to work on one such research project. A type of field work that is very useful to the Center programme is the attendance of students at committee meetings and regular sessions of the Florida legislature. Students are also often in attendance at committee meetings where policy decisions are made within state agencies. This is a very important part of the practical education afforded by the Center. Needless to say, this type of activity is facilitated because the university is located in the state capital.

The case study method is heavily utilised in the Center programme. The generalisation of concepts taken from case studies are instrumental in the inductive development of theory. In an informal way the Director of the Center works with other professors to attain a reasonable balance in the inductive and deductive methods of learning and in the presentation of theory and practical application.

An important aspect of the general programme is the writing of problem-oriented research papers. These papers are presented and defended before the class or in the bi-weekly, non-credit seminar. This is one of the major ways of evaluating non-classroom work. In that these papers are judged not only for research design but also for written communication the evaluation is broadened. The final means of evaluation is extra-university. This means of evaluation comes when state agency representatives evaluate the research students do on contracts and grants related to state needs. This evaluation is on a professional basis and is very objective.

5. RESEARCH BASE

One of the strongest emphases in the environmental center programme at Florida State is each professor's transmittal of his knowledge and enthusiasm of his personal on-going research efforts. This emphasis is heightened by the students' participation as graduate assistants in on-going state-oriented environmental research projects. In several cases the students' efforts have been rewarded by an authorship or co-authorship of a professional paper on his research.

Two of the primary objectives, as stated earlier in this paper, are the gathering of base data for governmental agencies, and second, to educate specialists to handle environmental problems. On the basis of reaching these two objectives, the state is placed in the position where they can anticipate environmental problems and attain a posture of action towards their solution rather than reaction to a crisis situation. A major function of the Center Director is to assume the role of broker between state environmental research needs and university research specialists. An objective and final evaluation of the success of this research operation is the giving or holding up by governmental agencies, of funds which support the Center.

In terms of funding the Center is primarily funded through a grant from state government. However, as research is undertaken to meet the needs of specific agencies, that agency is requested to provide a small portion of the research funds in order to prove their commitment to the project.

6. CRITERIA OF SUCCESS

A primary measure of success of this young programme has been the number of students currently working in state, regional and local planning or environmental oriented agencies. Numerous letters and testimonials have been made

to the state university system and the Florida governor's office in regard to the high quality of work done by the graduates of this programme. In fact, the recent legislative funding was made at the request of the state agencies who had benefited from the operation of the programme on a non-funded basis. Students are highly satisfied in regard to their opportunities to work with governmental agencies, the opportunities they have to receive funding for their Master's thesis, and their association with the governmental agencies from which they seek post-graduate employment. Success can be measured by the level of credibility exemplified in the Florida legislature, through the funding for the Center, and through the numerous requests made by state agencies for participation in Center projects.

The concept of a research-oriented teaching centre and an educational programme to produce environmental research specialists has been a success at Florida State University. This success is due to very close co-operation between various agencies of the government of the state of Florida and the Florida State University. Another factor in the success of the Center is the co-operation among the professors of the various disciplines and the administration of the University. A final factor which contributed to the success of the Center programme is its flexible administrative structure. This allows the Center to help initiate research projects but it does not provide any administrative barriers to their completion. Through the further development of this Center, the state of Florida will better be able to meet its current resource and environmental challenges and also do a better job of planning to maintain or enhance the quality of life of all her citizens.

Part Three

MEMBERS OF PROFESSIONS CONCERNED WITH THE ENVIRONMENT

National School of Public Health*

ENVIRONMENTAL EDUCATION FOR THE HEALTH PROFESSIONS

Rennes, FRANCE

by

J.S. CAYLA, Director

* Ecole Nationale de la Santé Publique (E.N.S.P.)

1. WHO DOES THE TEACHING?

Teaching is supervised by a sanitary engineer and given by four engineers, one hydro-geologist, two graduate chemists, one virologist, one bacteriologist, one physicist and one nutritionist.

Selection is based on academic qualifications and evidence of personal involvement in the area of environmental protection.

Assistant-teacher posts are offered to the best students in the health engineering section, but they are only retained in the teaching body if they show an interest in teaching and research and reveal the necessary aptitudes. Depending on their individual aptitudes, some specialise in directing the applied research being done by students, while others mainly teach.

The school also calls in eminent specialists to give courses, or single lectures on specific subjects.

Syllabuses are based on the occupations for which the students are training. The teachers have to organise the instruction they give on this principle and they are also consulted on curricula (in the teachers' committee, for example).

Most effective way of improving the training given, and ensuring that it contributes towards the solution of both theoretical and practical problems, is to enlist the participation of outside bodies (public or private) in the programmes of studies and research.

2. INSTITUTIONAL ORGANISATION

The ENSP is a post-graduate establishment training all members of the health and welfare force. The interdisciplinary system employed involves the assistance of doctors, dentists, veterinary surgeons, pharmaceutical chemists, nurses, engineers, health and welfare inspectors, social security inspectors and hospital administrators. This helps to develop a team spirit and to teach team work methods. Research at ENSP is co-ordinated with that at Rennes University, the Director being a member of the University Council and of its Science Advisory Board. The ENSP also belongs to the joint university and industry association for the development of research and innovation in Brittany (EURIB). During 1972 it worked on 13 subsidised research projects and received 22 research contracts from public and private sources.

The organisational structure is flexible and the maximum of freedom is enjoyed. Curricula are constantly being revised, largely in the light of the results of ENSP investigations and research. At national level, the School co-operates in this field with the Ministry of the Environment and other "grandes écoles". Internationally it maintains relations with the WHO, from which it receives a large number of sponsored students.

The students are in continuous contact with their teachers and with other students following more advanced studies who are thus in a position to give them useful advice.

3. COURSE CONTENT

The aim is to give students an ecological outlook, largely through epidemiology which is the science of the relationship between the environment and disease. Doctors, dentists and veterinary surgeons therefore spend 135 hours on methods for understanding the physical environment. Pharmaceutical chemists give 107 hours and nurses 74.

Ways of influencing the environment are given 66 hours by doctors, dentists and veterinary surgeons, 32 hours by pharmaceutical chemists and 43 by nurses.

These courses represent the following proportions of the student's total time:

- doctors, dentists 23%
- pharmaceutical chemists 16%
- nurses and midwives 14%

To these figures should be added the number of hours devoted to nutrition and health planning. The natural and social sciences are integrated with the epidemiological curriculum and interdisciplinary work in the field.

4. TEACHING METHODS, MEDIA AND MATERIALS

The curricula are based on the work the students will have to do in their professional lives, and teaching methods are tailored to suit the subjects and their practical applications. Particular stress is laid on interdisciplinarity. The teaching body is itself pluridisciplinary and trained to work as a team.

In environmental education it is essential that engineers, doctors, biologists, hydrogeologists, physicists and chemists should co-operate, and they must, at very least, co-ordinate the instruction they impart.

Visits are organised to waste-water and drinking-water treatment installations and to industrial plant; together with hydrogeological excursions these form an essential supplement to the teaching given in lecture room and laboratory.

Practical work in the laboratory is intended to introduce students to analytical methods or to improve their knowledge of them. Such methods are then applied in the field by the students themselves as part of the curriculum, either with local communities or industrial firms.

The students are trained to use the school computer for their calculations and for general interpretation of their findings.

Psychosociological teaching related to health education prepares students for contact with the public, boards, committees, study groups and authorities.

The preferred method of teaching is through the students themselves breaking a problem down into its constituent parts, investigating the various possible solutions, deciding which is best and then preparing a plan for mobilising the resources necessary to cure it.

Progress is evaluated by repeated testing, not only of the knowledge acquired by the students so that gaps can be filled by refresher courses as necessary, but also (indeed primarily) of the teaching itself in terms of the impact made on each group.

The usual audiovisual media, such as slides, films and closed-circuit television, using the school's own video-recording facilities, are supplemented by documentation, statistics, charts and drawings of which students have to prepare a critical analysis after studying them in their own time.

5. RESEARCH BASE

In the case of doctors, research accounts for 37 per cent of training time (250 hours for individual and 78 hours for group work). For pharmaceutical chemists the corresponding figure is 36.7 per cent. For nurses and midwives it is 38 per cent.

The work is applied research in the students' own professional spheres and it is designed to provide advice for the local authorities as required. It is therefore, entirely focused upon the needs of the community. The methods used are evaluated in order that they may be corrected and improved.

Studies of the possible effects of innovation on the environment are now being introduced into the course.

Applied research, which is already very useful for teaching purposes, has the further advantage of providing the School with finance for the projects themselves - in some cases even covering the annual repayments on

loans for building and fitting out new laboratories. Income and contracts was over Frs.500,000 in 1972.

6. CRITERIA OF SUCCESS

The average annual enrolment for the environmental courses is:

20 doctors
5 pharmaceutical chemists
15 nurses and midwives

As pre-selection for French students is severe, the success ratio is high. Results in 1972, for example, were as follows:

	Number Enrolled	Number Examined	Number successful in terminal examination
Doctors	22	22	17
Pharmaceutical chemists	3	3	3
Nurses and midwives	15	12	12

Students who have not made the necessary progress are advised not to take the examination (although they may do so at their own risk). This happened in the case of 5 African ex-nurses who had taken up medicine in the third year and who, although they had graduated as doctors, did not have an adequate basic training. Students' satisfaction or dissatisfaction is assessed at the end of each term and subsequently by means of questionnaires sent to them during the first three years of their professional lives after they have left the School.

The success of ex-students is, of course, one of the best yardsticks for the value of the training given. They have no difficulty in finding jobs because at present there is a shortage of public health staff. Former students are now working in France, abroad under bilateral co-operation agreements, or for international institutions. The WHO, for example, sends the French officials it recruits to the ENSP courses.

The Association of Schools of Public Health in the European Region (ASPHER) has asked the ENSP to organise a seminar on environmental education at Rennes in 1974. At this the following subjects will be discussed:

1. General review of curricula in environmental health.
2. Laboratory studies and services as a contribution to the promotion

of research and to the improvement of teaching programmes in environmental health.

3. Improvement of environmental health teaching curricula.

It is no easy matter to make a cost/benefit study of such training. But in the environmental field, the benefits to education in the form of service and research are already an economically measurable "output" that should be deducted from the cost.

7. RECURRENT EDUCATION

Mono- and pluridisciplinary continuing education is well developed at the school.

No great inducement is needed to attract participants to the further training courses. To take one example, applications to attend a course on swimming-pool supervision which the school is organising in September, 1973 already exceed the maximum of 90 for two of the three sessions to be held, and 45 applications have already been received for the third. One reason for the likelihood of these courses being a complete success is that their curricula are based on surveys that invited members of the professions concerned to indicate what was needed.

Michigan State University
College of Engineering

ECOSYSTEM DYNAMICS:
A CASE STUDY OF AN EDUCATIONAL PROGRAMME

East Lansing, Michigan, UNITED STATES

by

H. KOENIG and E.D. GOODMAN

INTRODUCTION

When we think of environmental studies or environmental education, our first reaction is to turn to the natural environment as if to "embrace" it with increased understanding and devotion. To a point this is valid and appropriate, but if the next generation of students are to realise any solutions to our ecological problems (ecology here used in the broadest sense of man in relationship to his environment) then we must turn our attention 180° and look at the affairs of man.

The pages following provide a case study of a two-term sequence of three courses developed to deal with a particular dimension of environmental education in the context of the above orientation. This course is motivated by the realisation that if man is to adjust his affairs to the limitations of the natural environment to produce his resources and to process his wastes, then the student must first of all understand more completely the limitations of his environment to carry out these functions. He must have the ability to predict, for example, changes in the ecological state of important environmental components such as lakes, streams, terrestrial regions, etc., when they are subjected to previously non-existent nutrient and temperature stresses. This capability demands that his educational experiences extend considerably beyond the reaches of a descriptive understanding of the natural environment to the development of a capability to model and to analyse ecological structures under conditions of stress. The courses described in the pages following were developed jointly between the College of Engineering and the College of Natural Science to fulfil this need and are typical of a class of developments Michigan State University feels is critical to a sound environmental education programme.

1. WHO DOES THE TEACHING?

The basic concepts of systems science important to the formal analysis and control of biological communities, with emphasis on modeling of behaviour through analytic and computational procedures, are presented by a systems

science specialist with some substantive understanding of biological processes. The basic biological principles with emphasis on the functional roles of organisms in processes at various levels are presented by an ecologist with some basic orientation to systems science. Each course is offered annually in parallel, the first being directed at students of biology and ecology, the latter to students of mathematics and engineering. Students from the two parallel courses are then brought together as a group in the second term, structured around team solution of problems. This structure along with a brief description of the courses are included in the attachment. Also included in the attachment are copies of two project reports carried out during the second term.

The structural programme outlined above has proven to be an overwhelming success, attributed to several factors:

1. The faculty selected for the courses are both outstanding teachers;
2. They both possess a personal commitment to the subject area;
3. Their areas of technical expertise are complementary;
4. They are "working partners" in a productive multi-disciplinary research effort;
5. The students are highly motivated by the structure of the course, its content and enthusiasm of the instructors;
6. The limited size of the classes (approximately 50 students), along with the project structure of the second term, provides an opportunity for a very high level of student-instructor interaction;
7. The project effort gives the students an opportunity to experience first-hand the benefits that can be achieved by working co-operatively between disciplines.

2. INSTITUTIONAL ORGANISATION

The courses are offered within the academic framework of the Department of Zoology and the Department of Electrical Engineering and Systems Science, with appropriate cross-listing to provide visibility and academic support. The faculty involved in the courses hold positions in the respective departments.

Initiation of this programme was dependent in part on the use of released funds (from the ecosystems grant) to allow hiring of additional faculty. In the sequence's first year, 1971-72, both instructors were hired into temporary (non-tenure-stream) positions, one in Electrical Engineering and Systems Science, and one jointly in that department (which supplied the salary)

and with the Department of Botany and Plant Pathology. In part because of the success of these courses, the first position has become a regular tenure stream appointment, and the second position has been created as a regular position in the Department of Zoology. In both cases, the courses assisted in justifying these additional positions in a situation in which positions are generally lost, rather than gained. It can be seen that the research activity served directly to point out the need for this training programme, and indirectly in making its initial financing possible.

It is felt that this structure, that is, a set of courses offered within the existing administrative framework, is most appropriate for environmental education. The importance of this area will not dwindle in the foreseeable future. Environmental understanding and tools for establishing viable interactions between society and the physical and biological environment must be made a regular part of the curriculum of our scientists and engineers, not just a special interest area for study by a few students. This point of view indicates the necessity for modifying existing educational structures (e.g. faculty, curricula), rather than establishing special centers or institutes apart from the mainstream of activities of undergraduate and graduate students.

3. COURSE CONTENT

In deciding to what groups of students to address the sequence, the instructors considered several factors:

- The number of students with particular sets of prerequisite skills,
- The potential for interacting with, contributing to, or preparing for research efforts, given students of a certain level and background, and
- The trade-offs between prerequisites required and the time to teach that material within the sequence.

It was first decided that the two first-term courses should be viewed only as preparation for the second-term course, so that students were required to obtain the instructor's permission to enrol in one of the first-term courses. In this way, the instructors could gauge both the student's background and his interest in taking the whole sequence. It was decided to aim the course at graduate students and seniors, with a few exceptional juniors allowed as well. One major decision was to allow biologists with no former training in computer programming to take the sequence. It was felt that making FORTRAN a prerequisite would have eliminated a very large number of excellent students. Of course, it became necessary to teach FORTRAN during the first-term

course for biologists as a result of this decision, but that material occupied only three weeks (9 lectures). FORTRAN was chosen over BASIC or another "easier" language because of the familiarity the engineers already had with it. For the engineers, no biology prerequisites were established, but FORTRAN and differential equations were de facto prerequisites (required in early years of any engineer's or mathematician's programme).

Systems Concepts for Biologists

Biologists, in their first term course, were taught fundamentals of modeling from a state-space viewpoint, to which engineers at M.S.U. are also exposed. They were taught to programme in FORTRAN, and to use the University's time-sharing computer system. They were taught techniques for numerical solution of simultaneous non-linear differential equations.

Throughout the course, no attempt was made to "shoehorn" complex biological phenomena into a linear system framework for ease of analytical solution; rather, the students were given the tools for numerical solution of the non-linear systems they formulated. A number of simple biological systems were modeled on the blackboard, and the students also used two "canned" simulations prepared by the instructors to give the students some experience in observing the dynamic behaviour of a simulated system. One of the simulations was of a Daphnia magna population, and the other simulated plant succession of an old field. In each case students had a great deal of flexibility in manipulating inputs, parameters, etc. and performed "experiments" to attempt to obtain specified types of behaviour. The structure of each of these simulations was presented to the students in class, giving them an opportunity to observe a modeling and simulation effort from initial formulation of questions and assumptions to final implementation. Each student wrote and ran four computer programmes during the term, including one which involved solution of a set of simultaneous non-linear differential equations. The programmes were checked by the instructor, and the student was told to resubmit any incorrect programme until the results were correct, assuring a minimum level of performance before continuing with further programmes.

Ecological Concepts for Engineers and Mathematicians

This course, offered concurrently with the one described above, was to familiarise engineers with some terminology, concepts, and methodology used in addressing environmental concerns, and with ecological and biological regulatory principles at many levels. The course was not designed to serve as a general biology course; it emphasised mathematical treatment of biological processes. It also utilised the Daphnia simulation used in the other course in order to provide some common ground between the two groups of students.

Team Project Course

The second term of the sequence brought together students from the two first-term courses into 14 groups of 3-5 students. Each group contained both engineers and biologists, balanced as well as possible with regard to biological training, modeling, and programming capabilities. The students organised these teams around topics of their own suggestion, made available in advance of an organisational meeting where the actual membership of each group was constituted (with approval of the instructors). In most cases the topics were closely related to the previous interests of at least one team member, who helped to make literature available to the others initially. Every week each group met with the two instructors for one hour and without the instructors several times, typically several hours each.

In the first few weeks the students were asked to read extensively, and to formulate a set of very specific questions towards which they wanted to direct their efforts. As soon as they could they were asked to prepare a flowchart or diagram of the organisation of the system as they were going to study it. Some groups required longer to do this than others - some had detailed diagrams in two weeks, others not for about five weeks. Programming of modules or components of the systems was begun as soon as a structure was decided upon. Generally, gathering of data and estimation of parameters was pursued concurrently with the other work. The groups typically began to have running simulations in about the sixth or seventh week of the term, although some were "chasing bugs" right up to the end of the term.

The group gave one-hour presentations of their work in public sessions in the ninth week of the 10-week term. A written report was submitted by each group one week later. The oral presentations were publicised by circulating abstracts to faculty in several departments, and about twenty of them attended one or more presentations. Their comments were generally very positive about the nature and quality of the work the groups had done.

These faculty and other individuals have requested copies of the written reports, so that about 10,000 pages of material have been distributed.

4. TEACHING METHODS MEDIA AND MATERIALS

This sequence is strongly material and method-dependent. While the two first-term courses were taught in a standard 3 lecture/week format, the course for biologists was strongly dependent on ease of access to computer facilities.

The use of a time-sharing computer system, with its capability for instant error diagnosis and correction, was required to allow the compression

of a term's material on FORTRAN into 3 weeks. The use of on-line simulations was also very valuable in teaching both systems concepts and computer simulation techniques.

In the second term, the teaching format was rather unconventional, involving two faculty and (typically) four students working together weekly on a problem. It seems to be essential to the success of the groups that this type of faculty interaction be maintained. Almost all groups required fairly extensive guidance initially, and each week a number of groups were "bailed out" of actual or potential difficulty by the instructors, sometimes over biological problems, sometimes over modeling or computer problems. In addition to the guidance provided by this close involvement with faculty, there was a large amount of motivation provided via this structure of weekly meetings. The instructors enhanced this motivation by requesting weekly written summaries of progress, difficulties, assignments of tasks, etc., from each group. The level of effort expended by most groups was very large (typically in the range of 6-15 hours per student per week, judging from students' responses). A number of students requested that the course be assigned more than 3 credits, because of the large time commitment required. This is being considered for the future.

5. RESEARCH BASE

The success of the course, its orientation and future stability is to a great extent conditioned and critically dependent upon the research base provided by a multi-disciplinary programme of research and development in ecological systems. The value of such research to give direction, relevance and meaning to such a course cannot be overemphasised. Conversely, the value of the trio of courses as a feeder into other environment-oriented educational and research efforts cannot be overemphasised.

A large number of the projects begun during the course have been further pursued after the end of the course. Several of these are now the bases for doctoral dissertation research. A number are being prepared for publication as journal articles. Several projects have expanded in scope and are now NSF-supported research efforts.

A further result of the course relevant to research is the availability of graduate students who have now had some ecological modeling experience. Many of these students are now research assistants on the Ecosystem Design and Management or other research grants.

Even those students who are not now directly involved in biological systems studies have gained a new perspective on the environment and man's relationship to the biological world.

6. CRITERIA OF SUCCESS

The success of the sequence of courses has been very good from several viewpoints.

a) The students completing the sequence have been a valuable source of research assistance for research grants.

b) The students have evaluated the course content, methods of instruction, and the instruction per se as excellent. Many express the idea that it is the most valuable college course they have taken.

c) The sequence has brought to both the Department of Electrical Engineering and Systems Science and the Department of Zoology students whom they would not otherwise have served, and thus, particularly in Engineering, is very beneficial to the department.

d) The indication from students who have completed the sequence is that they feel their job-seeking position has been improved by the sequence, but no statistics regarding this have been compiled.

While the faculty effort involved in this sequence is large, the cost effectiveness, particularly after the initial development year, is quite good because of the large enrolments relative to many other classes at the advanced undergraduate and graduate levels. The student credit hour/full-time-equivalent faculty ratios for the three courses during the second year of their offering are as shown here:

First Term	:	Systems for Biologists	:	720SCH/FTEF
		Ecology for Engineers	:	326 SCH/FTEF
Second Term	:	Project-Oriented Course	:	162 SCH/FTEF
Sequence overall			:	285 SCH/FTEF

All of these ratios compare quite favourably with the corresponding course-level averages for the University and for the Department of Electrical Engineering and Systems Science. An increase in the credits of the second term from 3 to 5, more in line with student effort, would further increase this ratio.

A more valuable measure of the effectiveness of the sequence, however, is the high degree to which the students leaving the course make immediate use of the tools and concepts they have learned to use. The goal of the sequence is to provide not only environmental awareness, but the ability to analyse and formulate solutions for environmental problems. The success which the students have had in doing this is the best indicator of the worth of the sequence.

University of California at Berkeley

COLLEGE OF ENVIRONMENTAL DESIGN

Berkeley, California, UNITED STATES

by

W.L.C. WHEATON, Dean

CONTENTS

I. GENERAL DESCRIPTION 137
II. EXTENSION - RECURRENT EDUCATION 139
III. TARGET GROUPS 140
IV. INSTITUTIONAL ORGANISATION 141

EDUCATIONAL PROCESSES

1. Who does the Teaching? 146
2. Institutional Organisation 147
3. Course Content 148
4. Teaching Methods, Media and Materials 149
5. Research Base 151
6. Criteria of Success 153
7. Recurrent Education 155

Enrolment Table 156

I. GENERAL DESCRIPTION

The College of Environmental Design was organised in 1953 by the voluntary federation of existing departments of Architecture, Landscape Architecture and City and Regional Planning. Architecture had been an independent department on the Berkeley campus for three-quarters of a century. Landscape Architecture had emerged from the College of Architecture in the first quarter of this century, and City and Regional Planning was a new and independent department created in 1949.

This federation was a voluntary one conducted by relatively autonomous department faculties with the concurrence of the Campus administration. The action reflected the community of interests and viewpoints common on the West Coast at the time and in preceding years because of the demands of climate and landscape. In this dramatic and rapidly growing State the professions had traditions of working together and common interests in blending the built environment into the natural with a maximum of harmony. The first Dean, William Wilson Wurster, one of the great leaders of the "Bay style" in architecture, reflected this community of interest in his espousal of simple residential buildings fitting both climate and terrain and local materials into a landscape often lightly touched by one of the several distinguished landscape practitioners of the same era. The warm desert climate of California also encourages an "enclosed" or urban style in which the small watered garden is a true part of the house, and house openings extend it to the outdoors. Again, the linkage between the design professions is apparent.

At its organisation, architecture and landscape architecture curricula were primarily through four or five year undergraduate professional programmes, while City and Regional Planning was entirely through a two year graduate programme. By 1963 the combined faculties had voted to convert all undergraduate instruction to a liberal arts format with a major in one of the disciplines. In these programmes a student cannot take more than one quarter of his work in his departmental major or 40 per cent in the College. He must, in short, pursue a liberal arts education. Under this approach professional instruction is concentrated in the Masters programme which varies in length from two to three and a half years depending upon the prior preparation of the candidates. In subsequent years Ph.D. programmes have been approved for each of the departments so that total enrolment in 1972 was as shown in the attached table.

It should be noted that Architecture continues to enrol more than half of all the students, the other two departments have grown from less than a quarter of the total enrolment to nearly one third. This distribution of students appears to accord with the American demand for professional practitioners, though both Landscape Architecture and City and Regional Planning may be called upon to take on some additional students, particularly in the fields of Environmental Protection. The College's enrolment is limited by its own academic plan. The faculty believes that needed expansions in design education should occur on other campuses in the University system or in private or State Colleges.

The College is housed in a building completed in 1964 of 96,100 square feet, which includes a full complement of classrooms, studios, practice and research laboratories, exhibition halls and jury rooms. There are no plans to extend this facility. It is already one of the largest on the Berkeley campus. Although abundant room for the extension of research activities exists at an engineering experimentation station a few miles away, it seems quite probable that facilities will begin to be built for research purposes at this location in the next decade. All three departments have terminals to the University's central computer and access to the computer facilities at the Lawrence Radiation Laboratory. These resources are among the most complete in the world. The College has its own library of 100,000 volumes and a large number of pamphlets, periodicals and other publications and slides, plus a growing archival collection of the original drawings of West Coast architects. The building adjoins the headquarters buildings for the social sciences, art and law, and is relatively near the extensive facilities of the College of Engineering. All of these other branches of the University play an important part in the educational programmes of all students.

Although many research programmes at Berkeley are conducted directly by the teaching departments, probably the largest share of organised research is conducted at Institutes and Centers which cut across disciplinary or academic lines. The departments of Architecture and Landscape Architecture both have research laboratories, but all of the departments of the College conduct a large proportion of their research through the Institute of Urban and Regional Development or through comparable Research Institutes having related interests, such as the Institute of Governmental Studies, the Institute of Traffic and Transportation Engineering, the Institute of Business and Economic Research, the Earthquake Engineering Research Center, or others of the fifty research institutes on the Berkeley campus.

The undergraduate and graduate students in the College have available to them the course offerings of the seventeen Schools and Colleges and more

than sixty Departments of the Berkeley campus. While there are risks in identifying new academic linkages as more important than any others, it seems evident that architectural students draw heavily upon the social sciences, engineering and business administration. Landscape students will tend to utilise agriculture, forestry and conservation, and geology. Students in City Planning will draw heavily upon the social sciences, business administration, law and public policy. Undergraduate and graduate programmes leading to "joint majors" are common, i.e. many undergraduate students acquire the qualifications for a major in architecture and in engineering or a major in landscape architecture and in forestry and conservation. At the graduate level two other formal joint degree programmes between City Planning and Law, City Planning and Public Health, and informal programmes between Architecture and Engineering, Architecture and Business Administration, Architecture and Public Health, Landscape Architecture and Forestry, and Landscape Architecture and Geology. Since it is a characteristic of the Berkeley educational system that departmental required courses are minimal the number of students crossing departmental lines to explore new linkages in learning can be large and varied. There have been recently extensive linkages between Architecture and Public Health and Medicine on the programming of health facilities and with Criminology on re-examining the design of prisons and analogous facilities. The Department of Psychology participates actively in Landscape Architecture's visual simulation laboratory, a major scientific center for the study of psychological and visual aspects of the environment and the measure of responses to the environment. Housing is taught in Architecture, City Planning and Real Estate Departments of the School of Business Administration.

II. EXTENSION - RECURRENT EDUCATION

The University of California Extension Division caters to over a quarter of a million students per year, far more than those in full time attendance. Extension offers no degree programmes but a substantial number of certificate programmes. In Law, Engineering and Medicine an overwhelming majority of the registered professionals take review and updating courses in Extension every year. No such proportion of recurrent education exists in Architecture, Landscape Architecture or City Planning. However, the Extension Division dealing with environmental education at Berkeley offers some fifty courses per year including programmes leading to certificates in transportation planning and environmental impact planning. These require the equivalent of one year's full time graduate work. Extension courses include regular daytime

or evening courses on the Berkeley campus, on the special San Francisco City campus or at numerous locations elsewhere in the Bay Area, short courses of a week or weekend's duration and very intensive courses compacted into two or three successive weekends. A thousand students a year participate in these courses. The number should be multiplied many times. The programme is under the academic direction of the faculty of the College but is independently administered. Many courses are offered for a popular audience. Those offered for professionals must be approved by the faculty concerned as to content and as to the qualifications of the instructor, usually a practising professional.

III. TARGET GROUPS

The Berkeley programme in Environmental Design was organised for the primary purpose of educating or training professional practitioners in Architecture, Landscape Architecture and City and Regional Planning. Historically the Architecture and Landscape programme were five year undergraduate professional degree programmes. In 1963 the faculty voted to eliminate purely professional education from the undergraduate programme so that it became a liberal arts pre-professional programme leading to an AB degree with a major in the selected field. The faculty's expectation and subsequent experience indicated that a third or more of the undergraduates do not go on into the professional training in the field of their major. Many instead go into law, business administration, public health, education, or other fields. Presumably they bring to these activities a continuing interest in the environment.

Since 1963 the faculty has inaugurated Ph.D. programmes for advanced research and training in all three of the disciplines. Approximately half of the graduates of these programmes to date have become teachers in other professional schools and are embarked upon careers in professional education. The other half are employed in highly specialised work in government, private foundations, research institutions, professional offices and international agencies.

The College also offers some courses for the education of other groups. Over a thousand students a year from other colleges on the Berkeley campus attend environmental design courses. Through these offerings the College and the Extension Division reach a much larger audience of citizens. Some specialist programmes are offered to "decision makers", e.g. specialist extension programmes for city managers or, currently, a massive programme to train State highway engineers in environmental impact assessment methods.

The outline subtitle "Specialist-Generalist" raises different issues within the professions from those raised when the same questions are applied to education more broadly. Sometimes a clear cut decision by the faculty de facto trains specialists within each profession rather than generalists. Historically there have been few specialists within the design professions. Indeed these have emerged only within the last decade.

Berkeley, however, has become a school which trains professional specialists, sometimes to the neglect of its responsibilities for training professional generalists. The same phenomenon is evident in medical or engineering education. Each of the departments offers clusters of courses which enable the student to acquire a fairly highly specialised professional education. The number of these clusters of offerings is too great to enable the student to do more than sample all of them, and each of the departments requires a degree of concentration so that the net effect is to place considerable emphasis on specialist training, and to offer few incentives for those who would prefer a broader education for general professional practice. In Architecture the fields of specialisation include architectural design, environmental controls, structure and production, design theory and method, social and behavioural factors, architectural administration and history. In Landscape Architecture there are area design and environmental planning. In City and Regional Planning they have recently included regional economic development, housing and renewal, land use planning, systems analysis, transportation and social policies planning. Urban Design, so called, is not a separate specialisation in any department as is the case at Harvard or Pennsylvania, but is a joint degree offered by any two of the departments.

IV. INSTITUTIONAL ORGANISATION

The College of Environmental Design is an organisational unit of the Berkeley campus of the University of California. The College faculty is relatively autonomous in its control over the educational policies and practices of the College and relatively autonomous in its recruitment of faculty and selection of students. In the control of courses and curriculum the faculty is subject to the reviews and approvals of campuswide faculty committees. Its appointment of faculty members is similarly subject to campuswide faculty committee review. The admission of undergraduates is handled by a campuswide service department subject to standards and prerequisites specified by the faculty of each department. Graduate admission is done by the departments. In both cases there are strict numerical quotas reached by agreement between the College and campus officials.

Administrative control over the College on the Berkeley campus is maintained through a Dean appointed by the Chancellor of the campus and Chairmen of the Departments, who are also appointed by the Chancellor upon recommendations received from the faculties in each field and the Dean. Since the bulk of educational policy and most educational administration is conducted at the department level, the dual role of the chairman as a representative of the faculty and administrative officer of the University gives the faculty considerable influence in all educational matters. The budget and enrolment limits are major points of campus control over the College. These are negotiated by the Dean with the campus administration. However, there is an academic plan for the College which reflects agreement within the College regarding its relative size, academic interests and other objectives. This plan has been approved by campus committees dealing with courses, educational policy, budget and personnel and therefore is a persuasive reference when issues arise. The College is also instrumental in developing a state-wide plan for higher education in the design professions. This serves to support the College's position.

The organisational relationships within the College and between different professions have been heavily influenced by the faculty's observation of programmes at the competing institutions from which many, if not most, of the faculty were drawn, i.e. Harvard, MIT, Penn and Chicago. Relationships between the College and the campus are largely derived from the evolution of the Berkeley campus with its unique history as a high quality public educational institution. Thus Berkeley developed early in its history the tradition of faculty control of courses, curricula and faculty recruitment. These traditions have been refreshed by periodic battles with external authority, so that they remain a vigorous and active part of the academic environment today, are embodied in the regulations of The Regents and are largely deferred to by the State Legislature. Naturally this degree of autonomy requires a high degree of faculty review of courses, academic personnel, curricula and other matters which are particularly exacting because of their continuing exposure to public inquiry.

Several things follow from faculty control. First is an excessive emphasis upon research achievement as the chief basis for promotion and reward in the academic system. This leads to recurrent efforts of students and the administration to achieve a more balanced emphasis on teaching and other activities. There is little evidence that these efforts counter-balance the influence of faculty control on the system. Similarly, each department is reviewed and accredited by the professional societies responsible for those functions. While the faculty regards these reviews as important and interesting, it conceives that the future of the several professions will be shaped

more heavily by faculty and students than by the judgments of the practising professions and therefore tends to resist this form of outside pressure. A large proportion of the faculty however are heavily engaged in civic and professional affairs, are officers and leaders in national and local professional societies, use the community as the locus for problem centered instruction and thus become doubly engaged in community and professional activity in a variety of ways. This leads them to be especially responsive to changing community attitudes and changing professional styles and to adopt current fashions and new ideas with alacrity. This does not necessarily lead to a quick acceptance of innovation in educational methods which are extremely difficult to change. Thus there exists a fairly rapid change in the content of courses alongside marked stodginess in the course structure and methods of presentation. In the Extension Division the influence of administration will be substantially heavier than that of faculty, largely because a very high proportion of the faculty will be part time professionals whose main centres of activity are elsewhere. Educational innovation may therefore tend to be easier than in the home departments where full time resident faculty with tenure and with control over the curriculum tends to dominate.

Four other aspects of the institutional arrangements at Berkeley may be of interest. The first of these is the general question of the locus of environmental study programmes. In the United States environmental studies directed towards the man-made environment have been historically organised around architecture, the earliest of these professional disciplines to emerge in academia. Specialist studies in the natural sciences and in engineering have rarely led to the development of comprehensive schools dealing with the natural environment. Indeed Michigan's School of Natural Resources is well known as an early exception to this general rule. Instead programmes on water resources and water development (for power, navigation and irrigation) have been the broadest exemplar of attempts to bring together engineers, hydrolomists, geologists, agronomists and the like. Public Health programmes which deal with sanitation and waste problems and, to a lesser degree, air pollution have been the only other special fields to have a broad concern with the environment.

The College of Environmental Design faced the choice of whether to double its own size in order to become an educational centre dealing with the analysis and control of the larger natural environment, or to support other branches of the Berkeley campus in their efforts to launch new programmes in these fields. Since the College enrolment had long since exceeded its policy and physical space limits the College chose to support the efforts of the departments of the College of Agriculture and Forestry to establish a programme in Natural Ecology, and of Engineering and Public Health to establish broader programmes of natural environmental controls. The departments of Planning and Landscape

Architecture are minor partners in each of these efforts but resist attempts which may double or triple their size to directly meet this need. The intellectual stance justifying this position is that each of the professions is already interdisciplinary in content to the limits of teachability, and that therefore it is preferable to maintain a larger environmental bias within the established professions producing a more manageable subject matter and to collaborate between existing and new professions serving public needs. There are exceptions to this generalisation; the general research arrangements cited below, the joint programmes to which reference has already been made, and the Ph.D. in Environmental Planning organised by the Department of Landscape Architecture which has a specific objective of advanced research and education in environmental analysis and regulatory systems.

The relationship between the teaching programme and the research facilities within the University and with other organisations is similarly complex. As noted above, each of the departments conducts some organised research activities within its departmental organisation. Thus, there is an Architectural Laboratory, a Landscape Visual Simulation Laboratory and the like. At the same time, there are forty-odd research institutions and independent laboratories on the Berkeley campus which are independent of departments and managed by individual groups of faculty members. These organisations have emerged and been approved by campus committees of the University Administration to deal with problems of public service or which cross disciplinary lines. Thus the organisational structure of the Berkeley campus is a lattice organised vertically by traditional disciplinary teaching departments and horizontally by research institutions which tend to be interdisciplinary and problem focused. The faculty member has his appointment, tenure and academic home in a department, but he may spend half or more of his time and be engaged accordingly in a research institution which reflects his professional or scientific interests. It is as likely that a member of the Department of City and Regional Planning would be engaged in research in the nstitute of Business Research as it is for a member of the Finance and Taxation faculty of the Business School should be engaged in research in the Institute of Urban and Regional Development. Research Institutes are not authorised to grant degrees and in effect become teaching departments. Doubtless there will be experimentation in this field in the future. For the time being academic arrangements are sufficiently flexible so that almost any student can arrange to have an interdisciplinary major, avoid uninteresting requirements to his major field by substituting equivalent requirements from some other area and thus achieve a problem focused major.

Berkeley has also had many opportunities for non-institutional co-operation, local, national and international. The College has exchange programmes

for faculty or advanced graduate students in Europe, Asia and Latin America. It is quite resistant to an extension of these arrangements for the simple reason that a very much larger extension would pre-empt faculty control over its admissions or faculty assignments. It would be quite possible at Berkeley to have exchange arrangements with a number of institutions equal to the total number of students admitted each year. Similarly attitudes influencing the faculty's attitudes on formal arrangements of inter-institutional co-operation on research. There are available an adequate number of institutions for research on campus. A portion of the faculty maintain private professional offices. Groups of the faculty have operated several non-profit corporations for research where the subject matter or the convenience of the faculty makes it more attractive to conduct the research off campus than on campus. Twenty or thirty members of the faculty have arrangements with national or international research organisations which occupy a fair share of their research time. In some cases these arrangements overtax the time and energy of the faculty so that there is neither the disposition nor the ability to enter into more numerous or more highly organised or centrally controlled co-operative arrangements.

Although this may seem to be a counsel of despair regarding co-operation, there are clear limits to the effective size of departments or faculties. They cannot be expanded indefinitely without serious deterioration of internal communication. That being the case, the number of internal relationships is clearly limited. One has the impression that the faculty of the College of Environmental Design has perhaps already exceeded the first limit and that its external contacts are extremely broad as a result of the individual efforts mentioned.

Finally, the departments of the College of Environmental Design assign students, undergraduate or graduate, to an official academic adviser who is a faculty member. Students are free to change advisers on their own initiative and with the approval of the department chairman. All advanced graduate students are engaged in research or other projects with faculty members so that they have fairly close contacts for advising and counselling purposes. The ratio of students to advisers here is about 8:1. Upper division undergraduates sometimes complain of difficulty in locating their adviser and the College annually seeks to make special arrangements for the advising and counselling of lower division undergraduates because it is thought that this function is poorly handled.

EDUCATIONAL PROCESSES

1. WHO DOES THE TEACHING?

Each of the Departments of the College of Environmental Design, Berkeley, contains specialists whose training is outside of the departmental professional field. For example, there are 15 persons on the faculty whose training is in sociology, economics, physics, operations research, applied mathematics, law, psychiatry, psychology, geology, botany, ecology and history. They are about evenly distributed between the three professional departments. The remainder of the faculty consists of specialists or generalists whose background training is in some field of architecture, landscape architecture or city planning. We insist that the part-time professionals demonstrate unusual skill as generalists or be among the ranking specialists within the profession. The specialist might be in lighting, mechanical equipment, structures, regional economic development, etc. The regular faculty members who are trained in other fields must be acceptable to the departments in those other fields, i.e. our sociologists in architecture must be acceptable to the faculty in sociology and listed to teach courses in that field. Thus, we believe that we have as good scholars in the College as Berkeley's general standing among premier universities in the world might suggest.

While we insist upon a commitment to teaching, in practice the American university system rewards research achievement almost to the exclusion of teaching, so that it is exceedingly difficult to find people who have equal commitments to teaching and to research. The situation is further complicated by the fact that some of the full-time faculty must practice architecture so that general architectural practice, like any other specialisation, is represented on the faculty. These lead to the most complicated criteria for the selection of faculty, something which is further exacerbated by the necessity for affirmative action programmes to assure an appropriate number of women and minorities.

Approximately 75 members of our faculty are "regular full-time faculty". An additional 15 positions are used to employ from 30 to 40 part-time instructors. These enable the faculty to bring into the teaching programme specialties

which a regular faculty cannot adequately reflect, kinds of interests which are of current concern to the students or the faculty and, most importantly, professional practitioners in the larger offices who have much to contribute from current practice to instruction but who are unable or uninterested in full-time teaching. In sum, we try to draw a balance between full-time teachers and part-time teachers at the ratios suggested and in each of the departments. In earlier decades as much as 50 per cent of the faculty has been part-time. We believe this excessive and, indeed, a ratio of 80:10 might be preferable to the ratio 75:15.

The faculty feels that it reflects, to a reasonable degree, the skills and experience required for teaching environmental studies, with a few exceptions. We lack a philosopher of the type Geddes, Mumford, Dubos, though we have some good talents in this field. We lack one economist with a specialisation in cost benefit analysis in environmental controls; we lack one physical ecologist. These are comparatively small deficiencies in what must be one of the highest quality faculties in the world.

2. INSTITUTIONAL ORGANISATION

In an earlier section I have dealt very heavily with these issues. I should here attempt to answer questions elsewhere neglected.

We do not make as heavy use of advisory boards and relationships with professional associations as many schools. Perhaps this is because we are not so dependent upon them. We have many links though through the individual members of the faculty. In other schools these functions could be of far greater importance. The locus of control for the faculty reward system is nominally in the Campus Budget and Personnel Review committees. However, these committees in turn perform in an international and national faculty reward system which, in effect, dictates their policies. A faculty which has achieved and continues to aspire to maintain a worldwide reputation is bound to rely upon peer judgment, chiefly in research in its reward system, and could not alter that position if it tried.

Various strategies for introducing external innovation have been attempted. The Extension Program (continuing education) is far less rigid and more flexible and therefore constitutes a testing ground for new courses and new fields. The University is now exploring the concept of an "Extended University" under which it would give degrees on a part-time, night school basis to those unable to attend full-time and in the day time. This, too, offers an opportunity for innovation. New subject matters stemming from scientific or technological discoveries also offer similar opportunities, biochemistry and ecology being

recent examples. In neither of these fields has a department been established but in both of them very large programmes exist. In the older biochemistry it is very prestigious, in the newer ecology it has not yet established its footing. Chancellors and Deans sometimes have announced policies of withholding 20 per cent of all positions as they become vacant to provide positions for innovative programmes. Such policies are naturally resisted fiercely by departmental faculties but persist under various strategems.

3. COURSE CONTENT

The College of Environmental Studies at Berkeley can only be described adequately by a review of the catalogue and several hundred course offerings. Each of the professions has its own definitions. Within architecture, environmental studies means the impact of the built environment upon human behaviour, and the design of physical environmental controls (light, temperature, air) and design of the physical environment to provoke, stimulate or facilitate what is conceived to be desirable social behaviour. To date, this latter field consists chiefly of research efforts to ascertain environmental-behavioural relations. Within Landscape Architecture, environmental studies consists of studies of the psychology of perception and the attempt to bring such learning into design instruction, studies of the impact of man upon the larger regional environment (flows of water, air, solid waste, etc.) and to develop environmental control policies to limit the effect of man's intrusion upon the environment.

In City and Regional Planning environmental studies includes the economic aspects referred to above in landscape architecture, studies of the social and economic environment and its institutional manifestations, and attempts to develop policies which will minimise unanticipated external effects of existing or planned policies, institutions or social arrangements.

During the late 1960's each of the departments substantially abandoned the notion of "essential contents" in their professional graduate programme. Landscape Architecture retains most of its former required courses. City Planning clusters its offerings in three or four course sequences of progressive difficulty and urges students to take three or four such sequences, but its only requirement is a written and oral examination in planning theory. Architecture requires students to have a course in each of the special fields offered. It has a "recommended programme" but no formal requirements in the old sense. Thus, students are free to specialise in some subjects to the exclusion of others. Few exercise this liberty; most take a recommended sequence which is a balanced list of offerings, including the introductory courses in each subject field and advanced courses in several elective fields.

There are no clearly identifiable conceptual bases for organising interdisciplinary or disciplinary programmes. The individual student and professor may agree on some such base and most students are prepared to do so, i.e. almost all students have had a sequence of courses in systems theory and simulation so that they are prepared to undertake interdisciplinary studies around such a core.

There have been sporadic efforts at interdisciplinary integration of natural sciences with social sciences. Few of these last very long. As a consequence, schools like the College of Environmental Design are compelled to do their own integration by the employment of natural scientists and social scientists and their assignment to synthesise the contributions of each around identical problem material. Elsewhere I have described the sciences represented on a full-time basis on the College of Environmental Design faculty. I observe that other professional schools at Berkeley, such as Public Health, also employ both natural and social scientists. It is a part of the history of almost all schools of design that local case materials are extensively used as demonstration problems. In a limited number of classes international comparisons serve a similar purpose.

Finally, international comparative studies and international perspectives are very common in the design professions. Several course sequences are intrinsically international, e.g. economic development and limits of growth issues. However, we rarely offer courses on the specific problems of specific countries or regions. Our international student enrolments in practice are limited to 25-30 per cent of all graduate students. These students are more interested in technical universals than in area specifics.

In addition, the faculty believes that it is preferable for those concerned with a specific area to study in that area, i.e. India's problems are best studied in India, Korea's in Korea. For this reason it has resisted every suggestion that it offers a specialised area, or developing area curriculum.

4. TEACHING METHODS, MEDIA AND MATERIALS

The specific topics listed in this outline title appear to be more relevant to general educational issues than to professional educational issues. Thus, in the professional schools:

a) Methods used for multidisciplinary and interdisciplinary aspects of programmes

Interdisciplinary instruction is common; often two or more people join in a course to integrate different perspectives; equally often a topic is treated sequentially by professors of different perspective or background.

b) Innovations required compared to classical pedagogic techniques

Design schools have historically used problem centered education as the core of their pedagogical method. The student must plan a city, design a building, or prepare a set of regulations for an area. To the extent that the content of design education has become less dogmatic or intuitive than was common in the 19th century, the case method of analysing problems in their full complexity has supplemented the problem method. The case method has in turn been supplemented, of course, by empirical and theoretical studies in special topics which contribute systematised knowledge in any field.

c) Methods used to provide for non-classroom learning experience

Education in the design professions has always involved extensive field trips, involvement in community projects and laboratory simulation of community development issues. In recent years when "participatory democracy" was at a peak of fashionability a very high proportion of students were engaged in some community activity, e.g. working with community groups to build school playgrounds, to prepare plans for a low income housing project, to revise older plans for the waterfront, etc. Given the inefficiencies of this method of learning and the discovery that community groups like any other group do not have miraculous capacities for reconciling differences, many students preferred to utilise the more efficient laboratory and classroom methods for learning similar things. Where it was faddish for students to work only with new, poorly financed, "local", "indigenous" organisations, many of these have disappeared, so there is now a more normal distribution of these individual field experiences.

d) Role of laboratory experience

The architecture laboratory once accounted for half or more of educational time. As specialised knowledge has accumulated and specialised courses have been offered, this proportion has diminished so that today it may account for one third of the educational experience. The design professions still lack the system of indexes and abstracts, professional societies, journals and other means for communication which can distil specialised knowledge, convert it to rules of thumb for operating experience and make it useful to large numbers of practitioners. The schools are, in some degree, experimenting with this problem.

e) Use of and access to computers

As stated elsewhere, Berkeley campus has ample computer facilities. Each of the departments has terminals to a central computer. Each of the departments has some specialised facilities, as for graphic display.

f) Means of utilising experience and materials of other organisations

Many members of the faculty record their research or professional experience so that it comprises case material for teaching purposes. A portion of the faculty regularly uses role playing or simple games as a regular pedagogical device. Most architecture and planning juries bring the mayor of the city concerned or other public officials from the area treated to the jury for real criticism from the standpoint of the real operating official.

g) Methods of evaluating student progress for various non-classroom learning components

Individual professors have developed many methods of evaluation; term papers, examinations - both written and oral, judgments by juries of peers on written or oral reports, and occasionally, by written evaluation of outsiders. The one important method of evaluation, "external examiners", has not been adopted here.

h) Methods of assessing commercially produced educational materials

The librarian and teaching assistants are regularly asked to scan such material. One group of three graduate students is now scanning all recent movies on housing. Aside from these efforts we have no systematic means of reviewing material. The council of planning librarians and the American Society of Planning Officials and the American Institute of Planners each conduct annual reviews of these materials but they tend to be reviews of current year materials only. There is clearly a need for an evaluative system. In addition, members of the faculty have put portions of courses on tapes, multi-media films and the like.

5. RESEARCH BASE

a) Research emphasis for different programmes for different target groups

The undergraduate programme tends to emphasise teaching more than research, although it includes many elements of architectural or landscape architectural studies which to the student appear as research. At the graduate level, students have a sufficient command over what is known and research methods to begin to work fruitfully on what is unknown. Thus, there tends to be a significantly higher proportion of graduate student participation in research. In addition, American universities commonly lack the equivalent of stipends so that many of our students are dependent upon the research salaries offered by professorially organised research projects for internal support.

b) Role and use of student research

We have no exact statistics but would estimate that one third of the graduate student group is supported by parental resources, one third is chiefly supported by part-time work in the profession and the remaining third supported by part-time work on faculty originated research projects. These proportions may vary from time to time and from department to department. In City Planning at one time 80 per cent of the students were on research projects. The proportion has never been so high in any of the other departments.

c) Basic research within existing disciplines versus "environmental consultancy" in surrounding area

Lacking precise data, I would guess that approximately one half of the research done in the College of Environmental Design consists of basic laboratory research as opposed to "environmental consultancy" types of research. Certainly both are evident and numerous. They are aimed at different objectives, the first being more scientific and the second more professional in its orientation, but environmental consultancies certainly are heavily used to generate basic knowledge, as is illustrated in recent ecological studies done by groups of faculty for and in response to unique community opportunities. Graduate student participation in both types of efforts is heavy.

d) Impact on university priorities for community-oriented research or investigations

University priorities for community-oriented research or investigations have a relatively low impact upon the educational establishment. First, the College faculty initiate many such activities long before their need comes to the attention of others. Second the University has no effective control over the allocation of faculty time. It could request departments to become interested, but such requests will be often ignored. University authorities have more direct control over research institutes which can readily accept funding and employ temporary personnel to engage in community-oriented research or investigations not attractive to faculties or beyond the temporary capacities of faculty.

e) Anticipating environmental problems before they reach crisis proportions

Both individual faculty members, departments and research institutes have a long history of anticipating environmental problems before they reach crisis proportions. The history of the State of California is intimately

related with the history of the University which led its statewide programme of agriculture, its land distribution, crop producing and other agricultural activities, helped devise its transportation system, advised on its systems of local government and, more recently, conducted basic studies demonstrating the necessity for a return to rapid and mass transit and demonstrated the growing dangers of air and water pollution. Often these voices have not been heard or heard adequately in dealing with poverty and race problems. But, these issues aside, Berkeley has shared profoundly in the "land grant college tradition" under which a major proportion of the university system was to assist the people through both research and teaching in the Extension division in the solution of problems of development.

f) Effect of science policy on environmental research by universities

In the United States science policy on environmental research is a shambles to the extent that it could be said to exist at all. Since university research is heavily dependent upon national funding, the possibility of university policy is indeed low. There exists virtually no co-ordination among funding agencies, virtually no sense of priorities, and virtually no means for establishing criteria or priorities. As a result campus efforts are equally weak and are dependent upon agreements between loose campus groups and research institutes. The campus maintains control only on solicitations exceeding $500,000 per year and there only to assure that requests do not exceed existing space and other administrative limits.

6. CRITERIA OF SUCCESS

a) Enrolment of students, proportion graduating

Current enrolment is shown in an attached table. At the professional level 85 per cent of all our enrollees are graduated. At the undergraduate level approximately 50 per cent of a freshman class graduates, but a larger number are admitted as junior (3rd year) admittees and of these approximately 70 per cent graduate. A study several years ago indicated that 85 per cent of the students once entered here and not receiving undergraduate degrees eventually receive an A.B. elsewhere. This is what one might expect where undergraduate admission is limited by law to the top 10 per cent of all high school students and in practice less than 10 per cent of graduate applications can be accepted.

b) Recruitment of staff

Berkeley is widely credited with being one of the outstanding universities in the world. If recruitment of staff is a criteria of success, we have

indeed been successful. I have personally been in charge of this function at Harvard, Penn and Berkeley and would judge our recruitment experience here as being easier and more successful than at the other two places, both of which are excellent institutions. Salaries here are slightly lower than those at the best private eastern universities and are comparable to, but also slightly lower than, the best public universities (Michigan, Wisconsin, etc.).

c) Student satisfaction

Student satisfaction has fluctuated widely in recent years. We have been through revolutions and counter-revolutions in student attitudes. Currently student interests are much more professional than they were four years ago. Bright students are always dissatisfied, always organising "better courses" and always organising "better research". Faculty response is usually very affirmative, channelling dissatisfaction into highly constructive outlets. Student organisation fluctuates and tends to comprise a tiny fraction of total enrolment. Only a fraction of these give evidences of dissatisfaction. On balance, one would have to say that there is a fair degree of student satisfaction and an active student effort to improve conditions which they find less than satisfactory, but that the total volume of the latter activity is not as intensive, purposive or continuous as many faculty members would like.

d) Employment, and how far it is attributable to training received

We have no adequate data on the employment of our graduates. To the best of our knowledge almost all of them are employed at least initially in the fields for which they received professional training. They often drift into other related fields, e.g. the architect becomes a developer, the planner becomes a mayor. Requests for help in searching for employment tend to be quite low, suggesting a high degree of success insofar as employment is a measure. We believe that there are national and state shortages in all three of the professions, but the quality of these estimates leaves something to be desired.

e) The changing of events (locally) or other impacts on community

I have elsewhere suggested that under the tradition of the land grant college, the University has a very active responsibility in the changing of events or policies. This very often involves a very judicious balancing of the role of the University, the role of the individual professor, and the role of research, such that the University does not encounter the violent

opposition of one group in its attempts to assist another. By any fair assessment, however, Berkeley is widely influential. Its faculty played important roles in recent years in the citizen movement to establish the Bay Area Rapid Transit System (BART) (research, community organisation, leadership by faculty and graduate students), in the movement to stop filling and polluting San Francisco Bay; in the movement which led to the passage of the State Environmental Protection Act; in the organisation of the Association derived from private foundations, business firms and individuals. Within the College of Environmental Design the relationship has not been so favourable. We attract in research funds 50c for every dollar of State based support. We believe that we should be at a 1:1 ratio.

f) Relevance to society; involvement of local community

I know of no way to evaluate relevance to society except through the number of involvements and public acceptance or rejection of University inspired proposed policies. By these measures the University appears to be relevant and involved with the exceptions noted above.

7. RECURRENT EDUCATION

This is described in one of the opening sections.

UNIVERSITY OF CALIFORNIA, BERKELEY
COLLEGE OF ENVIRONMENTAL DESIGN

Enrolment Fall 1972

	Architecture	Landscape Architecture	City and Regional Planning	Other (Design)	Total
Lower Division	242	31		10	283
Upper Division	359	81		24	464
Undergraduate Total	601	112	0	34	747
Master's Candidates	231	49	83	23	386
Ph.D. Candidates	18.5	3	20.5	0	42
Graduate Total	249.5	52	103.5	23	428
Total	850.5	164	103	57	1,175

Alternative Targets for 1976-77*

Undergraduates	500	85	0	20	605
Graduates	300	80	160	20	560
Total	800	165	160	40	1,165

* This illustrates the intent of the academic plan to reduce Architectural undergraduate enrolment and expand graduate enrolment, and to expand graduate enrolment in Landscape and City Planning, all within a fixed overall enrolment.

Columbia University
School of Public Health

THE ENVIRONMENTAL QUALITY MANAGEMENT PROGRAMME

New York, UNITED STATES

by

G.H. SEWELL, Head,
Division of Environmental Health Sciences

SUMMARY

The objective of the Environmental Quality Management Programme is to prepare professionals for policy-level positions in environment-related governmental agencies, industrial departments, and consumer-interest organisations. The teaching approach uses a multidisciplinary, problem-oriented methodology, and graduates receive either a Master of Public Health or a Doctor of Public Health degree. Under normal circumstances, a student can receive his Master of Public Health in about two years, while the Doctor of Public Health requires an additional year of classes and the preparation of a dissertation. Under some circumstances these periods can be shortened.

The Programme is designed to allow most courses to be taken within the School of Public Health; but a few, such as Environmental Law and a basic geography course, are taken in other parts of the University. About one-quarter of all courses are free electives, and these may be taken anywhere within the University structure.

By graduation, students are expected to have acquired an ability to:

a) Use a systematic, problem-solving approach to environmental malfunctions.
b) Include the widest possible scope of social, political, economic, and physical considerations in policy decisions.
c) Apply sound principles of planning and administration.
d) Confidently and skilfully present management concepts to public groups.

In addition, they are expected to have a firm understanding of:

a) The basic vocabulary of the environmental sciences.
b) All sides of continuing environmental issues.
c) Biological effects of pollutants.
d) The effectiveness of environmental-control technologies.

BACKGROUND

Columbia University, founded as King's College by royal grant from George II, King of England, was established in 1754 "for the Instruction of Youth in the Learned Languages and the Liberal Arts and Sciences." The Revolutionary War interrupted its development, but in 1784 it was re-opened as Columbia College. Columbia University in the City of New York became the official title in 1912.

The School of Public Health was established in 1921, and, for almost four decades, a vigorous training and research programme in the sanitary sciences or, as it has recently become called, the Environmental Health Sciences, was maintained. Courses trained students to operate sanitation facilities, such as sewage-treatment plants, and to conduct routine sanitation tasks, such as restaurant inspections. This teaching function was supplemented by a research programme that, for example, included during the late 1940's a mosquito eradication project for Puerto Rico.

During the sixties, several forces altered this pattern. State-supported institutions began to offer suitable programmes for technicians, and the highly qualified, often fellowship-supported students entering Columbia University's Master of Public Health programme began to regard sanitary sciences as having dubious applicability to their career plans. As student demand decreased, the educational function of the Division of Environmental Health Sciences was curtailed, and the faculty shrank to several members.

In 1969, Granville H. Sewell, who had established some environmental management courses in the urban planning programme of the School of Architecture, was invited to revitalise the teaching the Division of Environmental Health Sciences. A training grant was obtained from the U.S. government, and new full- and part-time faculty were hired. Meanwhile, the Division had acquired a fully equipped and staffed Community Noise Research Laboratory, and a Trace-metals Research Laboratory. Both had active research programmes and considerable professional standing. Pilot one-year programmes were taught for several years; and, in 1973, the one-year option was ended as the full two-year Environmental Quality Management Program was officially begun. Including associated programmes, about a dozen students have been placed in

professional positions, and, about 12 students, most of them doctoral candidates, are currently enrolled.

1. WHO DOES THE TEACHING?

Because of the intense research programme, the overall student:faculty ratio within the School of Public Health is approximately 3:1. For the Division of Environmental Health Sciences, the ratio is closer to 1:1. Backgrounds are extremely diverse. The director of the Program possesses a Bachelor of Science degree in civil and sanitary engineering from the Massachusetts Institute of Technology and a Doctor of Philosophy degree in political science, again from the Massachusetts Institute of Technology. Others on the faculty include a sociologist, a chemist, an M.D. toxicologist, an M.D. ecologist, a lawyer, an electrical engineer, an acoustical psychologist, an urban planner, a sanitarian, a physicist, and a theoretical mathematician.

The faculty represents a balance between research capabilities, professional standing, and teaching capabilities. Each must be outstanding in at least two of these. Several lack doctoral degrees, but they also possess considerable professional experience and are considered outstanding teachers. Another has several doctoral degrees and is noted for diversity and quality of research.

Several problems still plague the recruitment of faculty for the Program. Because of limited funds and a shortage of candidates, a person qualified to teach environmental economics has still not been identified. But it is possible that an endowed chair in the subject may be available by 1974. Also, categorical courses - air pollution, water pollution, and solid waste management - are taught by professionals holding full-time positions outside of the University. And, because of their shifting circumstances, they have not proven to be reliable from one year to the next. Virtually the entire faculty has been recruited by reputation among colleagues.

2. INSTITUTIONAL ORGANISATION

The organisational base for the programme is the School of Public Health. In terms of identification, this base has handicaps. Other students and faculty expect the Program students to share their health orientation. Physically, the School is in a medical-school complex, reducing the interaction with other fields. But there are also distinctive advantages. The field of public health has been undergoing subtle changes as the concept of "health" has broadened

to consider the "state of well-being". An attitude of professional problem-solving and the habit of viewing problems in their context of larger systems have proven to be assets. And, at Columbia University, the School of Public Health has specialised in the administrative sciences as applied to health, an approach that is particularly compatible with an environmental management programme.

When the Program was planned, a list of desirable courses was compiled. It was then found that most of these were already taught at the School of Public Health. These included administration, statistics, and environmental controls for institutions. Upon reflection, it was decided that epidemiology was also advantageous.

Some courses did not exist within the School. These included environmental law, environmental economics, and a basic course in geography. And, of course, there were specialised "categorical" courses in different areas of environmental concern. Only one course on environmental law was taught, and this was an advanced seminar for law students in the Law School. Fortunately, the same professor teaching that course also was teaching public health law in the School of Public Health. He agreed to use the public health law as a preparation course for students later enrolling in the environmental law course.

Environmental economics proved a more difficult subject, as noted earlier. Efforts are still being made to develop an appropriate course content. For geography, an excellent course had been offered for several years in the Department of Geography, and this became required.

As for many new programmes in a period of academic austerity, the budget for the Program has proven to be a constant problem. A government grant was received initially, but an inordinate proportion of the funds went to maintaining salary of existing faculty. The grant is not expected to be renewed after July 1974, and the environmental monitoring services offered by the environmental laboratory are being expanded in the hope of partially covering the deficit. Also, the Division of Environmental Health Sciences is offering more extension courses, a means of supporting faculty by earned funds.

3. COURSE CONTENT

The curriculum is designed to provide a degree of breadth and flexibility needed by students from diverse backgrounds and talents while, at the same time, providing a common basis in vocabulary and concepts. The curriculum has four phases: the foundation courses, the cross-discipline courses, the specialisation series, and the supervised field experience. Each phase has been included to provide a particular function in the total educational experience.

Foundation Courses

The functions of the foundation courses are to:

1. transmit the essential professional concepts,
2. introduce a systems-analysis framework that will allow students to handle the varied material and complex problems they will be encountering, and
3. provide a common experience and opportunity for interaction for enrolled students.

There are five foundation courses, all taught within the School of Public Health. The introductory and central course to the Program is General Principles of Environmental Quality Control, which students attend for an average of three hours weekly during the first semester. The lecture-seminar is essentially a survey course on the historical evolution of environmental management, definitions of terms, and an examination of specific problems, control technologies, and management techniques. A text book has been mimeographed and will be published by Prentice-Hall, Inc., soon. Graphic aids, especially slides, and field trips to environmental facilities, are used.

In the second semester, the General Principles of Environmental Quality Management is succeeded by Field Studies of Environmental Pollution. For eight weeks students work an average of four hours weekly in a laboratory, testing and measuring characteristics of water, air, solid wastes, food items, and noise. Field trips are made to an animal testing laboratory and to an air pollution monitoring station. The objective is to familiarise students with the primary techniques of measurement in environmental management and, perhaps more importantly, to illustrate the difficulties that interpretation of laboratory results will always pose.

The final eight weeks comprise a separate course, Field Studies of Environmental Pollution. The class is student-governed. A student chairman is elected or appointed, and they choose a topic of common interest. (Past examples have been solid waste management in New York City, air pollution in New York City, and an environmental impact statement for a ship channel on Long Island.) The faculty member provides advice upon request and arranges interviews when asked. Students choose their own place and time of meeting, and the only course requirement is that they submit a final report with each student responsible for one section of the contents. By this point in the year, students are familiar with each other and enjoy the team experience.

To assure the students understand the reasoning necessary to associate cause with effect, they are required to take the basic epidemiology course, Principles of Epidemiology. Particular diseases are used to illustrate the

distribution and courses of ecological change, and group seminars are used to discuss detection of positive factors and their prevention.

The final two courses are concerned with statistics and administration. Depending on the student's background, he is required to take 8 or 16 weeks of statistics, part of the emphasis being on sources of statistical information. Administration covers a range of management concerns, including such diverse topics as personnel and budgeting.

Cross-Discipline Courses

Law, economics, and geographic analysis are fields increasingly used by environmental management specialists. Political science was also originally deemed necessary, but a combination of inadequate time and the realisation that political science entered law and other courses heavily finally led to its exclusion. Environmental economics has not yet been established on a regular basis, but law and geography have been regularly taught. In all cases for cross-discipline courses the policy is to arrange for the student to take the course within the department where the discipline originates. The law course is taught in the Law School. The geography course is taught within the Department of Geography. It is hoped that the economics course can be taught within the Department of Economics. Thus, students are expected to more completely understand the approach and philosophies the particular discipline focuses on its subject.

Specialisation Series

The Program's breadth is regarded as a supplement, not a substitute, for professional specialisation in some aspect of environmental management. In other words, students are expected to obtain the tools they need to perform a specialised, recognised role as a working member of a team. To obtain this specialisation, each student is expected to take as part of his electives at least three courses within a specialty field, such as microbiology, biochemistry, engineering, law, or public administration. The Program has identified approximately 30 courses within Columbia University that can be directly related to environmental studies, and at least twice that number could be included in an acceptable specialty, such as chemical engineering. In addition, Columbia University students are permitted to transfer six credit hours from courses at New York University, a neighbouring institution. The permissible number of transfer credits could be increased under special arrangements. Unfortunately, the engineering faculty at New York University has recently been disbanded, and this has reduced opportunities for exchange.

Supervised Field Experience

The introduction of graduating students into the real world of environmental management poses some difficult re-entry problems. They find authority for environmental decisions hampered by inappropriate political boundaries and by other illogical division of responsibility. Because of the previous lack of trained manpower, many senior staff members of environmental protection agencies will be less qualified professionally than entering graduates, creating a state of distrust and animosity. Agencies are still buffeted by conflicting political pressures from industries, conservation groups and similar constituencies in an emotional-laden process that cannot be duplicated in the remote atmosphere of the class room.

In discussion with faculty and students, the decision was made to provide a transitional stage between class room activities and actual employment. (Students particularly liked the idea of possibly having a "trial work period" in a place where they might obtain permanent employment.) Ideally, the objectives of the field experience are:

1. acclimatise students gradually to their professional field,
2. delay the need for final employment commitment until opportunities have been surveyed from a field perspective, and
3. provide the student with an opportunity for some independent, professional work that enhances his educational experience and provides recognition in his field.

Responsibility for placement of students in the field has been shared in the past among faculty members, but during the summer of 1973 a new faculty member with the sole responsibility for identifying opportunities for both the Program students and several other categories has been hired.

The Categorical Courses

To provide breadth in the environmental area, a series of categorical courses - noises, radiation, air, water, and solid waste - have been introduced. The noise course can be taught by the Community Noise Research Laboratory of the Division, and the radiation course is taught by the Department of Radiological Physics in the Department of Medicine. The other categorical courses are being taught by professionals employed full-time in programmes related to their specialty. Because of the long-term importance of urban planning to the role of environmental management, a brief introductory course on urban planning is being taught.

Overall Programme

Within Columbia University, the Doctor of Philosophy degree is reserved for the School of Graduate Faculties. The School of Public Health, therefore, must provide only a Doctor of Public Health degree at the doctorate level. Currently, graduates at the masters level receive a Master of Public Health degree, but an effort will be made in the future to obtain a new degree known as Master of Science in Environmental Quality Management.

The course content of the entire programme is

First Semester		Credits
EHS P6207	General Principles of Environmental Quality Management	3
Epidemiology P6201	Principles of Epidemiology	3
Administrative Medicine P6202	Imperatives of Health Administration	3
Biostatistics P6201	Introduction to Vital Statistics	1½
Biostatistics P6202	Introduction to the Analysis of Experimental Data	1½
Geography G4000x	Environmental Bases for Regional and Ecological Studies	3
		15

Second Semester		
EHS P6217	Environmental Sciences Laboratory	1
EHS P6204	Environmental Factors in Urban Planning and Renewal	1
EHS P6206	Field Studies in Environmental Pollution	2
EHS P6211	Environmental Noise Pollution	1
EHS P6213	Maintenance of Air Quality	1½
EHS P6209	Public Health Law	3
EHS P6215	Solid-Waste Management	1
Electives		3
		13½

Third Semester		
EHS P6216	Environmental Radiation Control	1
EHS P6212	Environmental Economics	3
EHS P6242	Environmental Law	3
Electives		9
		16

Fourth Semester

Field Experience

Summary of Credits

EHS track	22
MPH core	12
Electives	12
Total	46

4. TEACHING METHODS, MEDIA AND MATERIALS

Lectures and seminar discussions remain the backbone of the Program. Field trips are used in several courses when applicable, and the field study and laboratory courses offer direct student participation or direction. But because of budgetary problems and an ancient building, student access to computers is virtually non-existent. Nor do the students have the common commercially produced educational materials, such as audio tapes, modular packages, and video tapes. Perhaps, though, because of the small classes and mature characteristics of the students, they have not registered complaints of being deprived.

5. RESEARCH BASE

The Research Program currently focuses upon the two laboratories, the Trace-Metals Research Laboratory and the Community Noise Laboratory. The first has been functioning for about 15 years, and is currently involved in about three projects. The largest is the Second International Survey of Trace-Metal Levels in the Environment, a follow-up survey to compare values with results obtained a decade ago in 16 nations and to establish a baseline for future surveys. Using recently developed equipment, the Division is also developing new techniques of measuring common pollutants, especially the trace metals. On a more health orientation, another study is comparing distribution of cadmium within human tissues to the occurrence of cadmium in the environment and the known diseases. Also, there is an active monitoring programme of factories using toxic metals in the New York City vicinity. The Community Noise Research Laboratory is supported by NASA funds, and is primarily concerned with aircraft noise. An effort is now being made to expand this scope. Both laboratories have staffs that teach in the Program and the experiences obtained through research have direct impact upon the quality of the learning experience.

6. RECURRENT EDUCATION

In the past, the Division of Environmental Health Sciences has had only minimum participation in continuing education programmes of the School. This is expected to be changed in 1973-74. A new director of continuing education for the Division has been appointed, and a minimum of eight extension courses are planned. In addition, night courses are being introduced; and the University has been petitioned to permit academic credit to be given for extension courses. Part-time students are being allowed for the first time, and the semesters have been shortened slightly to provide three semesters each year, permitting acceleration of programmes. The objective of these changes is to permit individuals to return to the School at intermittent points in their career. Also, there is a hope of attracting more local talent, diluting the full-time students who typically come from outside New York City.

7. INDICATIONS OF SUCCESS

Since a primary objective of the Program is to prepare students for professional positions, one indicator of success would be the ease of placement. Graduates have recently been receiving approximately four offers each. Salaries have ranged from less than $8,000 annually to about $32,000, the latter being for an M.D. who took over direction of an environmental health programme in a large county Department of Health. The largest proportion of students have found employment as planners in environmental protection agencies or departments of health at the State level. Final salaries have been about $17,000 for an M.P.H. Several Graduates, especially the Dr.P.H., have taught in community or junior colleges. And, as the Program becomes known, the ease of placing students has been noticeably improving.

Michigan State University

DEPARTMENT OF FAMILY MEDICINE

East Lansing, Michigan, UNITED STATES

by

S.M. JOHNSON, Assistant Professor

1. WHO DOES THE TEAC

Kinds of professional or disciplinary expertise

Our programmes are truly interdisciplinary and combine the efforts of basic scientists, behavioural scientists, clinicians and our own faculty family physicians. The degrees held by these persons are D.O., Ph.D., D.P.H.. in areas of expertise that relate to the family planning/population of medical fields.

What criteria for selecting faculty

Faculty are selected for participation in our programmes by their disciplines and our College on the basis of their commitment to training medical students and their motivation to provide young doctors with the requisite skills necessary to practise their craft. Specialists in particular areas (obstetrics, gynecology, pharmacology, family planning, etc.) relating to curricular needs are recruited to provide their particular input into the curriculum.

Balance between knowledge and teaching ability

A balance between knowledge and teaching abilities is a goal to be achieved. Ongoing programme evaluation by students, the Office of Medical Education Research and Development (OMERAD), and fellow faculty, is being relied upon to guide us in our future selection of personnel for participation in the programme. An ongoing programme of training physicians as teachers is conducted through OMERAD.

Non-university based professionals and others

Non-university based professionals are brought into the programme through appointment as clinical faculty or on an ad hoc basis. Their busy schedules make scheduling of their presentations difficult, but through the efforts of faculty co-ordinators specifically assigned to co-ordinate, integrate and facilitate the input of all personnel, duplication of presentations or lack of coverage of certain areas is avoided. A variety of media are utilised to most effectively aid input from a multitude of sources. Efforts are made to include the ideas and perceptions of these personnel into curriculum development and course development by holding organisational meetings at which all personnel involved in teaching a certain area are brought together for such exchanges.

Looking to the future, what are some of the desirable skills, knowledge, and experience that should be sought for teaching environmental studies

Looking toward future training goals in order to provide interested students with an indepth course in family planning concerns an obstetrician-gynecologist with special training in family planning should be recruited for a full-time faculty position.

2. INSTITUTIONAL ORGANISATION

Desirable/actual organisational base for managing an environmental study programme, i.e. monodisciplinary department, special institute, centre, etc.

Because of the diverse nature of the subject the desirable/actual organisational base for managing the development of a study programme in family planning/population is interdisciplinary, consisting of input from the basic sciences of: anatomy, embryology and/or genetics, physiology, biochemistry, pharmacology, pathology, microbiology and/or immunology; from the social or behavioural sciences of: psychology, sociology, preventive and/or social medicine/ and from the clinical sciences of: obstetrics, gynecology, surgery, pediatrics and medicine.

Relationship of this base to teaching and research facilities within the university, other organisations

This base is developed from the teaching and research facilities within the University and the community. To insure full utilisation of university resources colleges within the University draw on the teaching and research expertise of other units in a co-operative - reciprocal arrangement. The same sort of relationship exists with the community at large, but on a more informal basis established through contacts among individuals in the University and the community.

Main institutional constraints on the organisational base for the programme

Although development of a family planning/population programme has the authorisation and support of the Dean of the College, the impetus for such programme development resides at too low an academic level (assistant professor) and at a level with no administrative power. The College faces many pressures in the process of developing its curriculum and the lack of sufficient authority through which to implement programme development is the main organisational constraint on the programme.

Use of other structures such as advisory boards, professional associations, etc.

Currently programme development and implementation functions through a Biology Advisory Committee and an Advisory Committee on Osteopathic Education before any change is presented to the Curriculum Committee or to the Dean himself.

Determination of budget for programme, criteria, who decides?

To date no specific independent programme budget has been discerned. Expenses are covered as a part of other budgeted programmes. Ultimate authority for priority budgeting rests with the Dean.

Locus of control for faculty reward system

The locus of control for faculty reward ultimately lies with the Dean of this medical school, but his decision is heavily influenced by the recommendations of the department heads of the disciplines.

Strategy for introducing institutional innovation (if necessary) for establishing programme

At a policy level, if a new innovation is clinical, a Clinical Affairs Committee and an Assistant Dean for Clinical Affairs are at the interface between the inception of an idea and its presentation to the Dean for a final decision on implementation. At a policy level if a new innovation is academic a Curriculum Committee must approve proposals before presentation to the Dean for a final decision on implementation. However, in reality, depending on the Dean's interest, programme implementation can be informally hastened or retarded.

Necessary aspects of organisational arrangements to serve different target groups . . . special needs

As the need arises for educational programmes to serve target groups other than medical students a consultant sort of arrangement exists. Groups with particular needs or ideas for programme development have worked with college faculty on such a basis. Tentative plans are being developed for particular programmes, initiated and developed from within the College, to meet the needs of physicians in the field for continuing education, clinic patients for basic instruction, allied health personnel for more specific education, etc.

Possibilities for inter-institutional co-operation and exchange, national and international

Depending on the success of programme development within the College the possibility exists for inter-institutional, national or international co-operation and exchange.

Advising and counselling of students

No specific advisement or counselling programme exists for counselling students. However, an Office of Student Affairs exists in the College to provide a general service to students.

3. COURSE CONTENT

Scope of "environmental studies"

The followirg is an abbreviated example of a proposed course outline that would utilise interdisciplinary resources in order to present all pertinent aspects of the issue and to help orient the students into thinking family planning/population in every patient encounter.

Overall consideration

Medical Responsibility and Rights in Family Planning/Population.

DIDACTIC INPUT	PRACTICAL EXERCISE

I. Historical Perspectives

Objective: to understand the phenomenon of growth and to assess its relative importance.

- world population
- causes of explosion and implosion
- demographic transition
- population theories
- current situation
- future prospects

- determine the situation in Michigan
- determine the relative effects of diseases on world population (past, present and future strategies)

II. Changes in Populations and Components of Change

Objective: to understand the meaning of statistical measures used to describe populations.
- to understand how and why populations change.

- growth (population dynamics, natural increase)
- rates (birth, death, fertility and morbidity)
- composition and differentials
- industrialisation and urbanisation
- fertility patterns (age at marriage, childbearing, birth intervals, etc.)

- investigate a strategy for health care planning - consequences of change on family, education, environment, politics, etc.

III. Population Problems and Policies

Objective: to be able to anticipate societal factors that impinge on health.

- political (public service costs, resources, taxes, representation, security, planning)
- social (age structure, dependent population, aged, family, density, size, racial and ethnic minorities, public health, female employment, status of women, alternatives to childbearing)
- economic (income, growth, quality of life, unemployment, labour force, business)
- resource (natural, food, agriculture, recreation, planning)
- educational (school age children, population, sex, and parenthood)
- legal (current laws, minors, abortion, sterilisation, artificial insemination)

- analyse family health and welfare in terms of population impingements - home visits.
- consider ethical aspects: human freedom vs. social planning, survival vs. racial genocide, who should have children?

DIDACTIC INPUT	PRACTICAL EXERCISE
IV. Medical Aspects of Family Planning Objective: to become competent in knowledge of the anatomical, physiological and medical aspects of family planning. - anatomy and physiology of male and female - methods of contraception and research trends - fertility - infertility - sterilisation - abortion - medical complications	- learn to take an accurate and functional history - handle patients in all aspects of family planning - family planning clinics.
V. Health Aspects of Family Planning Objectives: to understand how family planning contributes to the total health welfare of the patient. - to understand the value of other members of the health care team. - to become familiar with referral sources. - venereal disease - illegal abortions - maternal and child health (nutrition and spacing) - family health - teenage contraception - preventive psychiatry - side effects - indications for family planning (medical, social other types) - child care and sex education	- consider ethical pros and cons of delivering health care in these situations. - work with members of the health care team - home visits, family planning clinics.

VI. Family Planning Communication

Objectives: to understand psychological and cultural aspects of family planning.
- in light of these factors, to be able to communicate to motivate for family planning.

- acceptability of message (taboo topics)
- social and cultural aspects
- types of groups
- resistances
- psychology of fertility
- communication to motivate for family planning

- work with simulations on premarital, abortion, family planning and sexual counselling.
- practice for family planning communication in pre and post-natal situations, etc. - family planning clinics, hospitals.

DIDACTIC INPUT	PRACTICAL EXERCISE
VII. Sociology of the Family	
Objective: to understand the structure of the family unit and its implications for health, now and in the future.	
- family structure - only children - sibling relationships - genocide - population concerns and the individual - male and female roles and fertility	- consider the effects of the family on health.
VIII. Organisation and Administration of Family Planning	
Objectives: to become familiar with organisational structures used to deliver family planning care and information. - to become familiar with the roles of the paraprofessionals on the health care team.	
- social services - types of family planning clinics - types of services - personnel - role of the paraprofessionals - data and evaluation of services	- visit agencies
IX. Education	
Objectives: to understand own sexuality and human sexuality in general. - to be able to educate others in family planning/population concerns.	
- human sexuality - population, sex and parenthood education - rights and responsibilities	- have input into the public schools health topics and those relating to sex education, population, family planning and parenthood education. - respond to community speaker requests.

X. Physicians's Role

Objective: to determine the family physician's role in the family planning/population problem and its solution.

- responsibilities
- rights

- summarise course in light of overall medical responsibilities and rights of family physicians.

Course Resources: Professors from various disciplines
Physicians
Community and State Agencies
Clinics
Instructional Media (films, video tapes, etc.)
Visual Aids (models, charts, etc.)

Format: lecture, panel discussions, informal discussions, field work, problem solving.

Criteria for determining "essential contents" versus elective subjects

The educational objectives of the institution and the various departments determine "essential contents" from elective areas. These overall goals and the social pressures of the day are the criteria that must be balanced within the time constraints of the curriculum. The medical programme is a compact, year-round, three-year programme. For this reason, as much as possible, family planning/population related topics are integrated into the existing curriculum. Development of a specific course may evolve to an elective position, or to a self-study programme, because of the time constraint.

Integrating natural sciences with social science

The basic premise on which our courses are developed is one of "systems biology". A structural or functional biological system is considered in one term by all clinical and basic science disciplines. For this reason integration of the natural, social and clinical sciences is the essence of our approach.

Use of local/regional illustrations and on-site demonstrations

Local/regional illustrations and on-site demonstrations are also essential in the training of our medical students. Practical experiences are drawn from local doctors' offices (preceptors), various area clinics and local hospital rotations.

International or global perspective

Students may take a portion of their third year clinical rotation in a foreign country. No specific family planning/population emphasis is made during that experience.

4. TEACHING METHODS, MEDIA AND MATERIALS

Related contents and objectives

Attempts are being made to define classroom objectives in behavioural terms, i.e. defining learning outcome by a verb that indicates observable behaviour. Course content is geared to attain these behavioural objectives.

Innovations required compared to classical pedagogic techniques

All audiovisual aids are available for use (slide projectors, films, video tapes, simulated exercises, etc.) to allow departure from the classical lecture presentation. Small group problem solving and free-time self-study units are also being developed.

Methods used to provide for non-classroom learning experience, i.e. field trips, community work

Early in their training students become aware of problems in the real world by working in private physicians' offices (preceptors) in a sort of on-the-job training experience. Specific clinic experiences that vary between such extremes as general family practice clinics to alcoholism or drug addiction treatment clinics. Community experiences designed to allow the student to associate with and work with other members of the health care teams (social workers, nutritionists, etc.) are also planned.

Role of laboratory experience

Laboratory experiences serve to reinforce other types of learning experiences. In the "spiral" concept of the curriculum certain redundancies of coverage are planned to re-emphasise topic areas and to give students additional practice in learning skills.

Use of and access to computers

Attempts are being made to computerise some clinic medical records. Students will be exposed to this development. If a student wishes to avail himself of further computer experience the University has extensive computer capabilities that are offered to students in a variety of courses. Computer Mediated Instruction (CMI) and Computer Assisted Instruction (CAI) are being seriously considered.

Means of utilising experience and materials of other organisations, i.e. role playing, case study documentation of actual environmental problems

Exposure to actual patients' histories is constantly occurring in the students' training. The opportunity to actually elicit histories from the patients alerts the students to the techniques of attaining necessary and accurate information. Simulated patient experiences are also utilised in [illegible]ing.

Rationale for different teaching/learning methods used

Different teaching/learning methods are used to provide an optimal learning climate for the students and prepare them as realistically and adequately for their needs in the "real world". Various media approaches are used to deal with individual learning styles.

Methods of evaluating student progress for various non-classroom learning components

The ability to perform as a "physician" in the handling of patients is evaluated on pre-established levels of competence determined by the students' level of training (i.e. different expectations for first year as compared to second year students). Simulated programmed patients are used to evaluate student examination abilities.

Methods of assessing commercially produced educational materials (video tapes, audio tapes, modular packages, graphics, etc.)

Arrangements can be made with the instructional media group in the college to obtain and preview particular materials. This has been done by individual instructors, by small groups and as a continuing education function of the Department of Family Medicine.

5. RESEARCH BASE

Research emphasis for different programmes for different target groups

At this time there is no particular emphasis on research programmes for target groups, beyond the understanding that one must be sensitised to cultural barriers and differences to seeking medical care, family planning services, health education, etc.

Basic research within existing disciplines versus "environmental consultancy" in surrounding area

Strong research programmes in reproductive physiology, communications, sociology, etc., areas that related to family planning/population, exist within the University. Whenever possible faculty with specific expertise or new knowledge are invited to departmental continuing education programmes designed for faculty, or to participate in appropriate classroom experiences designed for students.

Impact of university priorities on community-oriented research or investigations

Of necessity the top priority item of the College is training medical students to become physicians. Thus, community-oriented research, although it will and is being developed, is not emphasised at this point in time.

6. CRITERIA OF SUCCESS

The programme is in initial developmental stages and assessment of success cannot yet be discerned.

7. RECURRENT EDUCATION

How to encourage career professionals and others to seek it

Osteopathic physicians must constantly accumulate 150 classroom post-graduate hours every three years in order to remain active with the American Osteopathic Association. Many physicians have already professed a perceived need for more training in family planning/population concerns. Capitalising on this physician need and interest continuing education programmes are being proposed to provide this training.

OECD SALES AGENTS
DEPOSITAIRES DES PUBLICATIONS DE L'OCDE

ARGENTINA – ARGENTINE
Carlos Hirsch S.R.L.
Florida 165, BUENOS-AIRES
☎ 33-1787.2391 Y 30-7122

AUSTRALIA – AUSTRALIE
B.C.N. Agencies Pty. Ltd.,
161 Sturt St., South MELBOURNE, Vic. 3205
☎ 69 7601
658, Pittwater Road, BROOKVALE, NSW 2100
☎ 938 2267

AUSTRIA – AUTRICHE
Gerold and Co., Graben 31, WIEN 1
☎ 52.22.35

BELGIUM – BELGIQUE
Librairie des Sciences
Coudenberg 76-78, B 1000 BRUXELLES 1
☎ 13.37.36/12.05.60

BRAZIL – BRESIL
Mestre Jou S.A., Rua Guaipá 518,
Caixa Postal 24090, 05089 SAO PAULO 10
☎ 256-2746/262-1609
Rua Senador Dantas 19 s/ 205-6, RIO DE JANEIRO GB ☎ 232-07 32

CANADA
Information Canada
171 Slater, OTTAWA K1A 0S9
☎ (613) 992-9738

DENMARK – DANEMARK
Munksgaards Boghandel
Nørregade 6, 1165 KØBENHAVN K
☎ (01) 12 69 70

FINLAND – FINLANDE
Akateeminen Kirjakauppa
Keskuskatu 1, 00100 HELSINKI 10 ☎ 625 901

FRANCE
Bureau des Publications de l'OCDE
2, rue André-Pascal, 75775 PARIS CEDEX 16
☎ 524 81.67
Principaux correspondants :
13602 AIX-EN-PROVENCE : Librairie de l'Université, ☎ 26.18.08
38000 GRENOBLE : B. Arthaud ☎ 87.25.11
31000 TOULOUSE : Privat ☎ 21.09.26

GERMANY – ALLEMAGNE
Verlag Weltarchiv G.m.b.H.
D 2000 HAMBURG 36, Neuer Jungfernstieg 21
☎ 040-35.62.501

GREECE – GRECE
Librairie Kauffmann, 28 rue du Stade,
ATHENES 132 ☎ 322.21.60

ICELAND – ISLANDE
Snaebjorn Jonsson and Co., h.f.,
Hafnarstraeti 4 and 9, P.O.B. 1131,
REYKJAVIK ☎ (13133, 14281, 11936

INDIA – INDE
Oxford Book and Stationery Co.
NEW DELHI, Scindia House ☎ 47388
CALCUTTA, 17 Park Street ☎ 24083

IRELAND – IRLANDE
Eason and Son, 40 Lower O'Connell Street,
P.O.B. 42, DUBLIN 1 ☎ 01-41161

ISRAEL
Emanuel Brown
35 Allenby Road, TEL AVIV ☎ 51049/54082
also at :
9, Shlomzion Hamalka Street, JERUSALEM
☎ 234807
48, Nahlath Benjamin Street, TEL AVIV
☎ 53276

ITALY – ITALIE
Libreria Commissionaria Sansoni,
Via Lamarmora 45, 50121 FIRENZE ☎ 579751
Via Bartolini 29, 20155 MILANO ☎ 365083
Sous-dépositaires :
Editrice e Libreria Herder,
Piazza Montecitorio 120, 00186 ROMA
☎ 674628
Libreria Hoepli, Via Hoepli 5, 20121 MILANO
☎ 865446
Libreria Lattes, Via Garibaldi 3, 10122 TORINO
☎ 519274
La diffusione delle edizioni OCDE è inoltre assicurata dalle migliori librerie nelle città più importanti.

JAPAN – JAPON
OECD Publications Centre,
Akasaka Park Building,
2-3-4 Akasaka,
Minato-ku
TOKYO 107 ☎ 586-2016
Maruzen Company Ltd.,
6 Tori-Nichome Nihonbashi, TOKYO 103,
P.O.B. 5050, Tokyo International 100-31
☎ 272-7211

LEBANON – LIBAN
Documenta Scientifica/Redico
Edison Building, Bliss Street,
P.O.Box 5641, BEIRUT ☎ 354429 – 344425

THE NETHERLANDS – PAYS-BAS
W.P. Van Stockum
Buitenhof 36, DEN HAAG ☎ 070-65.68.08

NEW ZEALAND – NOUVELLE-ZELANDE
The Publications Officer
Government Printing Office
Mulgrave Street (Private Bag)
WELLINGTON ☎ 46 807
and Government Bookshops at
AUCKLAND (P.O.B. 5344) ☎ 32 919
CHRISTCHURCH (P.O.B. 1721) ☎ 50 331
HAMILTON (P.O.B. 857) ☎ 80 103
DUNEDIN (P.O.B. 1104) ☎ 78 294

NORWAY – NORVEGE
Johan Grundt Tanums Bokhandel,
Karl Johansgate 41/43, OSLO 1 ☎ 02-332980

PAKISTAN
Mirza Book Agency, 65 Shahrah Quaid-E-Azam,
LAHORE 3 ☎ 66839

PHILIPPINES
R.M. Garcia Publishing House,
903 Quezon Blvd. Ext., QUEZON CITY,
P.O. Box 1860 – MANILA ☎ 99 98 47

PORTUGAL
Livraria Portugal,
Rua do Carmo 70-74, LISBOA 2 ☎ 360582/3

SPAIN – ESPAGNE
Libreria Mundi Prensa
Castelló 37, MADRID-1 ☎ 275.46.55
Libreria Bastinos
Pelayo, 52, BARCELONA 1 ☎ 222 06 00

SWEDEN – SUEDE
Fritzes Kungl. Hovbokhandel,
Fredsgatan 2, 11152 STOCKHOLM 16
☎ 08 23 89 00

SWITZERLAND – SUISSE
Librairie Payot, 6 rue Grenus, 1211 GENEVE 11
☎ 022-31.89.50

TAIWAN
Books and Scientific Supplies Services, Ltd.
P.O.B. 83, TAIPEI

TURKEY – TURQUIE
Librairie Hachette,
469 Istiklal Caddesi,
Beyoglu, ISTANBUL ☎ 44.94.70
et 14 E. Ziya Gökalp Caddesi
ANKARA ☎ 12 10 80

UNITED KINGDOM – ROYAUME-UNI
H.M. Stationery Office, P.O.B. 569, LONDON
SE1 9 NH., ☎ 01-928-6977, Ext. 410
or
49 High Holborn
LONDON WC1V 6HB (personal callers)
Branches at : EDINBURGH, BIRMINGHAM,
BRISTOL, MANCHESTER, CARDIFF,
BELFAST.

UNITED STATES OF AMERICA
OECD Publications Center, Suite 1207,
1750 Pennsylvania Ave, N.W.
WASHINGTON, D.C. 20006 ☎ (202)298-8755

VENEZUELA
Libreria del Este, Avda. F. Miranda 52,
Edificio Galipán, Apdo. 60 337, CARACAS 106
☎ 32.23.01/33.26.04/33.24.73

YUGOSLAVIA – YOUGOSLAVIE
Jugoslovenska Knjiga, Terazije 27, P.O.B. 36,
BEOGRAD ☎ 621-992

Les commandes provenant de pays où l'OCDE n'a pas encore désigné de dépositaire peuvent être adressées à :
OCDE, Bureau des Publications, 2 rue André-Pascal, 75775 Paris CEDEX 16
Orders and inquiries from countries where sales agents have not yet been appointed may be sent to:
OECD, Publications Office, 2 rue André-Pascal, 75775 Paris CEDEX 16

OECD PUBLICATIONS, 2, rue André-Pascal, 75775 Paris Cedex 16 - No. 33.189 1974
PRINTED IN FRANCE